SCIENCE

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE OUTLOOK OF THE SECTION FOR EDUCATION[1]

IT is not expected of the presiding officer of this new section that he will make any extended address at this time. In fact those good friends who have had longer experience than I in the American Association and who proposed that I say a few words by way of introducing Section L to the association, very thoughtfully added the intimation that brevity in this speech would be altogether appropriate. Each presiding officer of a section may speak his mind at length in the regular vice-presidential address, delivered at the meeting following that at which he has presided. That address is in the nature of a valedictory oration. The first in the line of vice-presidents of any section has the sole opportunity of serving also as salutatorian for his section. It is an advantage over his successors which he is bound in honor not to abuse.

One thing, however, ought not to be left unsaid. The new section is glad that it is, and I should not fairly represent it if I did not express to the parent society its appreciation of the high purpose that called it into being. Its satisfaction in this regard is shared, I am sure, by the great body of school men throughout the land.

We see in this act of the American Association a sign that the alliance of science with education, more or less clearly dis-

[1] Address of the vice-president at the Chicago meeting.

cerned for generations past, is now an accomplished fact in these United States. That alliance would seem to many so much a matter of course that they will find it difficult to see any new significance in this step of the association. But there are those who, whether they approve or disapprove, will see in it a notable and characteristic stage in the movement of our civilization.

The conception of the unity of education was with us preliminary to this alliance. So long as there were in the minds of men two distinct forms of education, an elementary education altogether traditional and conservative in character, and a higher education liberal in spirit and concerned with the continuous renewal of knowledge, so long, in a word, as the higher and the lower education served diverse ends, running counter to each other, just so long that alliance could not be consummated. The higher education was already represented in such societies as this through the members of its several scientific departments; and popular education might be left to go its unscientific way, serving the purpose of a more refined system of police, as Daniel Webster described it.

Our national instinct, even more than our national convictions, has been working for generations against any such rift in our national education. We have made straight the way from every country school and every kindergarten to the highest universities. This fact is clear and has been widely noted. The related fact has been less often remarked, that in making a plain way for our pupils from the lowest schools to the highest, we have made a plain way for all learning from the highest schools to the lowest. The distinction between school sciences and real sciences is altogether repugnant to our civilization. We are not willing that any good knowledge shall be the guarded secret of an intellectual class. With regard only for such metes and bounds as are natural and inevitable, we are determined that all learning shall be for all the people. It is hard enough at best to bring science home to the unlearned without taking from it its scientific character. But we are committed to the removal of all artificial hindrances to its free course. We are devoted to the effort to bring real and uncorrupted knowledge home to all; and this new educational organization is a new declaration of that purpose and a new agency for carrying it into effect.

The alliance of science and education is more than an alliance. In our national life these two are one and can not be put asunder. It is sometimes said that scientific research is a thing apart from education; that those engaged in such research, in order to do their best, must keep themselves as free as possible from the temptation to give instruction. The eminent director of the Carnegie Institution has declared that it is not an educational institution over which he presides. The better agricultural experiment stations of the country, newly endowed under the Adams act of 1906, are seeking by all legitimate means to secure for members of their several staffs sufficient freedom from lecture engagements to enable them to carry on investigations that require long patience and the severest concentration. Each new foundation providing for research apart from any requirement of regular hours of teaching is welcomed as a new factor in our real scientific development. No one of these things is incompatible with that intimate and inevitable connection of science with education. Such provision for free-handed research is indeed requisite, if science is to do its full part in the great alliance. It is not that each individual investigator shall be expected to give some formal instruction. That is a subordinate

question with which we are not now concerned. The connection of our science with our education goes deeper; for he who contributes to our science contributes, *ipso facto,* to our education. In this larger sense the Carnegie Institution and all other agencies of scientific research are educational institutions, and could not, if they would, abstain from educational service. In such an educational system as ours, no spring of new knowledge can be opened of which the streams will not find their way down through the different grades of education, as far as they may have proper use and application. The great significance of a fully coherent system of schools lies in this fact, that it not only enables individual pupils to rise according to their several capacities, but that it also gives to every scientific discovery free course among our people, according to the degree of its usefulness and of its human interest.

But in this free circulation of knowledge we are not yet perfect. If the connection were already free and open in every direction, a large part of the work of this section would be already done. We have, in fact, only as yet brought part and part of our educational system together, established the first of their more intimate connections, given first assurance that our democratic dream is passing over into reality. The task yet before us is greater than that which has been finished, and to those who plan most largely for the future, that which we now see is only a faint promise of that which may be foreseen.

It goes without saying that the mere spread of scientific information, the popular science of a generation ago, is but the smallest part of what the scientific alliance will mean to education. Scientific method, the scientific spirit, appreciation of scientific achievement, the abiding expectation that the processes of life and labor will be brought more and more under the guidance of positive knowledge; these are some of the things that education has gained and is to gain in larger measure from this relationship. In every walk in life men are to learn to observe more accurately, to pay more respect to objective evidence, to care more and more for truth, until they welcome it even against their dearest prejudice. The moral gain is greatest of all. And that is reinforced by the closely knit successive stages of developing thought and method which science has to offer, luring the learner on and on to larger reaches of organized knowledge and up into full-rounded and majestic sciences.

I do not forget that education has other alliances. Its relations with art in all its forms of beauty and use, its relations with philosophy, its relations with religion and with democracy, are not to be ignored. But all of these relations are to be tempered and steadied by scientific knowledge; and for this age, beyond any preceding age, the union with science is of commanding and immeasurable significance.

There are three ways in which this section, reinforced by the great organization of which it forms a part, can render the scientific alliance of increasing value to our education.

In the first place, it can provide for the discussion and investigation of questions relative to the teaching of the sciences. The internal method of any science depends upon the materials with which it deals. That method is in most instances well established before the use of the science in instruction comes under serious consideration. The method of instruction, with which the educator is concerned, is conditioned, on the one hand, by the method of the finished science, and, on the other hand, by the relative ignorance and immaturity of the learner. To strike the right

compromise between these two sides at any stage of instruction, and then to advance from the learner's first standpoint toward the pure method of the science, by stages that shall keep the learner's effort at the safest and steadiest tension, this is a problem which presents endless variations and calls for the closest pedagogic scrutiny.

In the second place, there is the scientific treatment of the whole range of educational procedure. The same science which is to be present and influential in the teaching of our pupils is to have a large part in the training of their teachers and in the effort of teachers and of educational theorists to give new shaping and definition to the whole work of education. Our educational doctrine is quick to respond in these days to promptings from the scientific side. But here as elsewhere the severe standards of scientific method are maintained only with the greatest difficulty. In every borderland between pure science and the things that are keenly felt and valued in human life, this difficulty rises to its highest pitch. Education is a field in which the sense of human values is intense, and it is accordingly a field in which especial care must be exercised to discriminate between science and the shadow image of science. No other educational organization, I think, is so favorably placed as this education section, to exercise that fine and severe discrimination. It owes, accordingly, a sacred duty to the educational interests of the land as well as to the great association of which it is a part, to hold its standard of scientific work up to the highest level. This duty and this opportunity, more than any other single thing, is its reason for existing.

The relations of the section to the council of the association, under the well-framed plan of this organization, must be of the greatest significance from the point of view of scientific standards. So, too, its relations to other sections and to the affiliated societies. For a century, more or less, education has walked hand in hand with psychology. This close companionship is undoubtedly to be strengthened and elevated by these new opportunities of intercourse. We may hope that both sides may be gainers in this relationship. But there is no one of the sections and societies in which education has not a direct and vital interest, and from all of them this youngest section confidently expects to receive help and stimulus.

Moreover, while concerning itself with scientific standards, this section will be reminded that the whole question of scientific and pedagogic standards in our institutions of learning is pressing for solution. It can not be doubted that in many directions our educational standards are too low. They are also in a large part indeterminate. To have its part in raising and defining these standards is a high purpose which this section may rightly cherish. It can hardly be doubted that this is to be one of the greatest tasks in our field within the next decade. Our sense of its urgency is quickened by the fact that we not only need new standards at home, but we can not be content to be in an attitude of mere deference and acceptance as regards the educational standards of the whole world. We must have our part in the main current of world education and do our part in the making of world standards.

In the third place, there is the problem of the organization of science and education in their relations to government and public policy. Year by year governments concern themselves more with the affairs of peace and industry and the culture of human character. Year by year, in both peace and war, they put larger dependence upon the knowledge of the scientist; and education, with science and the arts, is its main dependence in exalting peace above

war, and in promoting the vital concerns of a peaceful society. In legislation, in administration, in the making of new provision for the betterment of life, there are larger responsibilities falling every year upon those agencies of human culture which this section and this association represent. It will devolve upon us here to consider changes such as these, and devise and recommend ways in which the larger duties and opportunities may be met.

There is not time to enlarge upon these considerations. But they are laid before you in the briefest possible compass, with the conviction that here is real work to be done, which will count for positive gains to our national life.

Elmer Ellsworth Brown
Bureau of Education,
Washington, D. C.

SECTION L, EDUCATION[1]

The first meeting of the new section for education of the American Association for the Advancement of Science was held on Tuesday, December 31, at 10 A.M. The meeting was called to order by the vice-president, Commissioner E. E. Brown, who, in a brief address, welcomed the members present and urged that the section always maintain the high ideals of education as a science for whose advancement the section had been formed. Three independent sessions of the section, and two joint sessions with other organizations were held. One of these joint sessions was with the American Psychological Association, and the other with the American Society of Naturalists. An open address was delivered before a large audience composed of members from all sections by Vice-president Brown on the topic "The Outlook of the Section for Education." This address is printed in full in the current number of Science. The officers chosen for the coming year are:

Vice-president—Professor John Dewey, Columbia University.

Secretary—Professor C. R. Mann, the University of Chicago.

Member of the Council—President C. S. Howe, Case School of Applied Science.

Member of the General Committee—Professor D. P. MacMillan, Chicago.

Members of the Sectional Committee—C. H. Judd, C. S. Howe, T. M. Balliet, E. L. Thorndike, C. M. Woodward.

At the sessions of the section the following papers were presented:

The Ethical Judgments of School Children: Professor H. A. Aikens, Western Reserve University, Cleveland, Ohio.

The Practise Curve as an Educational Method: Professor J. McKeen Cattell, Columbia University.

Practise curves were exhibited showing the improvement which occurred in learning to use the typewriter and in memorizing German words. The practise was continued as long as 365 consecutive days by two observers. Curves were also shown measuring the extent to which practise in one direction causes improvement in other directions. In such experiments the learner works as hard as possible for a short time each day and knows exactly what he accomplishes, and the plan seems to have some advantages as an educational method. The greatest possible concentration and exertion for a short time is probably the best way to learn, and the child is led to this by his efforts to improve his record. The experiment can be so arranged that all the elementary subjects—reading, writing, spelling and arithmetic—are required in the experiment and are in definite relation to a task in which the child becomes interested. There is a fair competition with other students which may be emphasized as far as is desirable, but the main com-

[1] Chicago, December 31, 1907–January 2, 1908.

petition of the child is with himself; he knows exactly what progress he makes and does the best he can to improve.

Practise Curves in Learning: W. F. Dearborn, University of Wisconsin.

The report concerned, first, the daily improvement made by twelve subjects in the ability to memorize rapidly the meanings of from thirty to fifty French or German words and passages of English poetry and prose. The subjects were college juniors and seniors and the practise was made daily for twenty days. The various subjects were then tested after intervals of from two weeks to ninety-five days to determine the relative permanence of that memorized before the marked gains of the practise compared with that memorized towards the end of the practise.

After practise, and in most cases after the first five or six days, it took less than one half the original time to do the same amount of work. There was a gain of time ranging from 53 per cent. to 62 per cent. in the learning of vocabulary, and 55 per cent. to 82 per cent. in the learning of poetry and prose.

The permanence of the practise gain was tested by determining the time necessary to relearn the first two and the last two lists of vocabulary and passages of poetry and prose. Two weeks after the end of practise three subjects relearned the last tests or passages in somewhat less time than the first (three subjects), after four weeks it took from one third to one half as long again to relearn the last passages as to learn the first (three subjects), after three months' time it took one half as long again to relearn the last passages. The permanence of the more rapid acquisitions was, therefore, less than that learned at a greater expenditure of time. However, the total time spent in learning and relearning in the last part of the practise is much less than that required in the earlier part—from 30 to 50 per cent. less.

This practise method is evidently well suited to some sorts of learning, especially where permanence of results is not a prime consideration, *e. g.*, in learning a declamation, and also where there is frequent opportunity for renewing acquaintance with the subject-matter. It is probably well suited to the learning of the vocabulary of a foreign language.

The Effect of Practise on the Range of Visual Attention: Professor Guy Montrose Whipple, University of Missouri.

The object of the investigation, which was prosecuted in the Educational Laboratory of Cornell University, was to determine the feasibility of producing measurable augmentation of the range of visual attention in adults by continued daily practise, and to determine by introspection the manner in which such augmentation, if present, was brought about.

Preliminary tests with 0.1 sec. exposure of simple geometrical drawings, digits and letters indicated that observers very quickly reached a physiological limit beyond which further progress was impossible.

Extended tests with 3 sec. exposure by means of a pendulum tachistoscope of varied forms of test-material—groups of dots, pictures, nonsense syllables, drawings, stanzas of poetry, etc., and with a 6 sec. exposure of groups of miscellaneous objects placed upon a table, indicated little or no improvement in the range of visual attention with practise, but revealed marked individual differences between different observers for different kinds of material. The factors which condition the range were determined with some exactness by an analysis of the results in the light of introspective evidence. The net result, pedagogically, is that it is not worth while, as has often been erroneously as-

serted, to conduct specific school exercises for training the range of attention. A detailed account will be published later.

A Method of Concentration in Teaching Medicine: Professor W. T. PORTER, Harvard University.

The Grading of Students: Professor MAX MEYER, University of Missouri.

Scales of Measurements in Education: Professor E. L. THORNDIKE, Teachers College, New York.

Professor Thorndike showed a scale of merit in handwriting, established empirically by gradings of several thousand samples of handwriting. Such a scale makes it possible for any specimen of handwriting to be graded rapidly and with any necessary precision. It also permits students of education who use it to give grades that shall have the same significance, no matter by whom given, and to present a measurement of the quality of handwriting attained by a given school in a brief and unambiguous set of figures.

The Place and Content of a Course in Biology in the High School: G. W. HUNTER, DeWitt Clinton High School, New York.

Statistics show that over 50 per cent. of the pupils in high schools in New York City leave before the end of the second year. Science work has won its right for existence in the curricula of the high school; a science having utilitarian value should be the one placed in the first year of a high school course of study.

The biological sciences are best fitted for the above purpose. Biology gives training in scientific method. It provides the child material which will be useful in preparation for future citizenship. It allows, in its various phases, of application to human affairs. Its informational content is of immense and farreaching practical utility.

A recommended course treats of the general principles of physiology of plants and animals, with special application of these data to the human race. Types are utilized to illustrate certain general biologic principles rather than to show classification. Emphasis is placed on the humanitarian and utilitarian aspect of biology as seen in its economic phases. More stress is laid on the informational and cultural content and less on the teaching of scientific method as such. Nature-study methods are used to some extent in observational work.

Such a course should not be offered as college entrance requirement, but should be supplemented by a year of either botany or zoology in the latter years of the high school.

The Scientific Basis of High School Studies: Professor C. DEGARMO, Cornell University.

This paper will appear in full in a future number of the *School Review*.

The Pedagogy of the Danish People's High Schools: Professor J. A. BERGSTRÖM, Indiana University.

The Teaching of Spelling as a Scientific Problem: Professor HENRY SUZZALLO, Teachers College, New York.

An Experiment in the Teaching of Homonyms: Principal H. C. PEARSON, Horace Mann School, New York.

This experiment was recently carried on in the Horace Mann Elementary School, in order to determine the relative efficiency of two common methods of teaching homonyms, one that of teaching a pair of homonyms together such as *pair* and *pear,* and the other of teaching two such words separately. The plan of the experiment was to have one section of a given grade teach homonyms by one method, and the other section of the same grade by another

method, care being taken to have all the factors in the teaching alike except the point of difference that we were trying to reach. The results of the investigation were submitted to careful statistical analysis and showed that the method of teaching homonyms together was more efficient in the third, fourth, fifth, sixth and seventh grades.

It is hoped that experiments of a similar nature will be conducted in other schools, so that the validity of the conclusions of this experiment may be more accurately determined.

Psychological Experts in Public School Systems: The Experience of Chicago: Dr. D. P. MacMillan, Director of the Department of Child Study, City School System, Chicago.

Dr. MacMillan traced the idea of establishing psychological experts in public school systems, showing that the demand for this came from persons who were not psychological experts, although their cause was ably championed by Professor Royce in 1898 before the National Educational Association.

In Chicago this matter was under discussion by the Board of Education during the years 1896–8. Several plans were discussed, but it was finally decided to organize a special department of the board whose officers should devote their entire time to this work. This was done in 1899, and the functions of the new department were defined as follows:

1. Research work. (*a*) Collecting anthropometric and psycho-physical data for the purpose of establishing norms and for determining such relationship as may be of service in pedagogy. (*b*) Applying accurate scientific methods to specific pedagogic problems, particularly methods of teaching and determination of the pedagogic value of various studies.

2. Examination of individual pupils with the object of advising parents and teachers as to their pedagogic management.

3. Instruction of teachers in child study and psychology.

The work of the department during the ten years of its activity was then described in some detail, and it was clearly shown that it is altogether feasible for consulting psychologists to carry on within school systems the line of activity which educational zealots and far-sighted scientists entertained and projected for them. The general recognition of the value of establishing such departments is in line with the most modern and progressive tendencies in education, and if the plan were adopted by a number of the larger school systems, untold benefits to the public school system would result.

Objective Measurements of the Efficiency of School Systems: Dr. J. D. Burks, Albany Training School for Teachers.

Reasons for the Existence of Schools of Education in American Universities: Professor C. W. A. Luckey, University of Nebraska.

The average attendance at the meetings was forty. Much interest was shown in the papers, and many of them were discussed at length. It was the consensus of opinion that this opening meeting of the new section was a great success and that it augured well for the future of the organization.

C. R. Mann,
Secretary

THE AMERICAN FEDERATION OF TEACHERS OF THE MATHEMATICAL AND THE NATURAL SCIENCES

A meeting of delegates of associations interested in the formation of an American Federation of Teachers of the Mathematical and the Natural Sciences was held in

Chicago on January 1, 1908. There were present 23 representatives of 13 associations, as follows: Association of Physics Teachers of Washington City, 1; Association of Mathematics Teachers of New England, 1; Central Association of Science and Mathematics Teachers, 6; Colorado Mathematical Society, 1; Connecticut Association of Science Teachers, 1; Indiana State Science Teachers Association, 2; Kansas State Association, Mathematics Section, 1; Michigan Schoolmasters' Club, Mathematics, Physics and Biology Sections, 3; Nebraska State Association, Physical Science Section, 2; New England Association of Chemistry Teachers, 2; New York State Science Teachers' Association, 1; North Dakota Association of Science Teachers, 1; Northeastern Ohio Association of Science and Mathematics Teachers, 1.

In the absence of the chairman, the meeting was called to order by the secretary, and Professor F. S. Woods, of Boston, was elected chairman *pro tem.*

The minutes of the last meeting having been printed and distributed, their reading was dispensed with.

The report of the executive committee was then read and accepted. The recommendations in that report were taken up for consideration. In accordance with those recommendations, the articles of federation were slightly amended, passed *seriatim*, and then passed as a whole in the following form:

1. The associations of teachers of science and of mathematics shall form as soon as possible an organization to be known as the American Federation of Teachers of the Mathematical and the Natural Sciences.

2. Associations only are eligible to membership in the federation. Any association whose purpose is the study of the problems of science and mathematics teaching, and whose number of active members is twenty-five or more, shall be eligible to membership.

3. By joining the federation, an association in no way loses its individuality, nor its right to conduct its work in its own territory in its own way.

4. An association joins the federation by appointing delegates to a body to be known as the Council of the American Federation, by having its delegates accepted by the council, and by paying to the treasurer of the council the dues as specified in number 6.

5. Each association shall have one delegate for every fifty members; but each association shall have at least one delegate.

6. Each association shall pay to the council annual dues of five cents per member of the association, in order to defray the necessary expenses of correspondence by the council. The fiscal year shall date from September 1 each year. The council is authorized to increase the per capita assessment of associations, not to exceed ten cents, if found necessary.

7. The delegates shall hold office for three years and be eligible for reelection. At the time of its organization, the council shall divide its members into three classes, one of which shall retire at the end of each year. The council shall notify each association each year how many delegates are to be elected by it then.

8. The council shall elect its own officers, namely, president and secretary-treasurer, who shall hold office for one year and be twice eligible for reelection. These officers, together with three others elected annually, shall constitute the executive committee of the council.

9. The work of the council shall be carried on mainly by correspondence, but an annual meeting shall be held, at such time and place as the executive committee shall select. At any meeting the members of the council who are present shall constitute a quorum for the transaction of business; but if less than one third of the members are present, all business so transacted shall be ratified by correspondence.

10. The duties of the council shall consist in devising methods by which the associations may work together for the betterment of the teaching of science and of mathematics. The council shall act toward each association in a purely advisory capacity, no association being bound by the terms of the federation to follow the suggestions of the council if it does not wish to do so.

11. All publications issued in the name of the federation shall be approved and authorized by the executive committee.

12. The council shall publish each year a de-

tailed statement of receipts and expenditures, and a brief outline of the work done during the fiscal year. This statement shall be sent annually to the officers of each association in the federation.

On recommendation of the executive committee it was voted that, pending the report of the committee on policy as to publication, the executive committee be authorized to print the reports and documents of the federation in such of the established journals as it may select.

At the meeting in 1906 in New York no officers were elected, but only an executive committee appointed. The articles of federation having now been formally approved by the meeting, the following officers were elected for the year 1908:

President—H. W. Tyler, Association of Mathematics Teachers of New England.

Secretary-treasurer—C. R. Mann, Central Association of Science and Mathematics Teachers.

Additional Members of the Executive Committee—R. E. Dodge, New York State Science Teachers' Association; 'F. N. Peters, Missouri Society of Teachers of Mathematics and Science; J. T. Rorer, Association of Mathematics Teachers of the Middle States and Maryland.

It was announced that the application of the federation for affiliation with the American Association for the Advancement of Science had been approved by that body, and that this affiliation entitled the federation to elect a representative to the council of that body. On nomination, duly seconded, the president of the federation, Professor H. W. Tyler, was elected as the representative of the federation to the council of the American Association for the Advancement of Science.

The questions: What can be accomplished by the federation that can not be accomplished by existing machinery? and, What does an association gain by joining the federation? were raised and discussed at length. Instead of trying to reproduce this discussion, the executive committee is preparing a statement of the purposes and proposed policy of the federation, and this will be issued in the near future.

The meeting adjourned, subject to the call of the executive committee.

C. R. MANN,
Secretary

THE UNIVERSITY OF CHICAGO

THE COLLEGE AND THE UNIVERSITY[1]

THE American university of to-day is a compound of two divergent and more or less antagonistic elements, which in the current academic languages, we call the college and the university. The college is in theory a place for general culture, for training the mind, broadening the intellectual horizon, and, so far as may be, making, by tasks physical, moral and mental, a man or woman better fitted for the work of the world. The university is a place of training for one's specific duties in life. Its functions include training for professional work, whatever the profession may be. Its general method is that of instruction through investigation, and its relation to the student is in many ways different from the task-setting work of the college. It demands for its teachers a somewhat different talent, that of creative work, and of the power and the will in one way or another to add to the sum of human knowledge.

Our colleges are English in their origin. Our universities are German in their inspiration and method. Thus far in America the one has in a way antagonized the other. There has been a tendency to build up the university work by neglect of the collegiate work. Very many institutions have given instruction in professional or technical subjects of university grade to students who have had no collegiate training, often even no work of the still lower grade we call secondary instruction. On

[1] Extract from the Report of the President of Stanford University for 1906–7.

the other hand, the college has gradually pushed itself upward, relegating its lower years to the secondary school, and absorbing two of the years which would naturally belong to the university. In most of our larger institutions the fourth collegiate year is frankly given to investigation or to the beginnings of university work. In fact, though not in name, it belongs to the university rather than to the college. In a general way the admission to the German university—or graduation from the secondary school, Gymnasium or Real-Schule—corresponds with the end of the sophomore year in the best organized American colleges. In England, where the university as such is still in a state of probation, the conditions are not very different, so far as degree of advancement on the part of the student is concerned.

Recognizing these conditions, there is a strong movement in Germany to introduce the American college, to set off the last years of the Gymnasium or Real-Schule, as an intermediate stage between the local preparatory school and the school of technical training and investigation.

In America there is a tendency to separate the college into two parts, the junior college, of two years, in which the work is still collegiate, and the university college, in which the work of the university begins. This separation, first accomplished at the University of Chicago, is still little more than a name. About the University of Chicago many collegiate institutions have become junior colleges, that is, institutions which recommend some or all of their students to the universities at the end of the sophomore year. This arrangement is in many ways desirable. It is better for the university to be as far as possible free from the necessity of junior college instruction. It is better for the student at this period to enter an institution with large faculty and large resources. Furthermore, if the junior college has the teachers and conditions it ought to have, it is in very many cases better that the student should take his early training there, rather than as a member of the enormous mass of freshmen and sophomores our great colleges are now carrying.

It is safe to prophesy that before many years the American university will abandon the junior college work, relegating it to the college on the one hand and to the graduate courses of the secondary schools on the other. Under these conditions its discipline and its methods of instruction will approximate those of the universities of Germany and other countries of Europe. Under these conditions the assistant professor of to-day will mostly find professorships in colleges; the professor will be an original scholar and investigator as well as a teacher, and the rule of Lehrfreiheit and Lernfreiheit will be established as a matter of course. It goes without saying that university conditions in America will differ in many ways from those of Germany. It is not likely that American legislative bodies will make a degree from the university a necessity for professional work, or its absence a bar to preferment. The trained man in America will have to take his chances with the rest, and for a time the "practical man," or even the ignoramus, may seem to distance him. But in so far as training is genuine, it will justify itself in every walk in life, and its value in the long run will be the more appreciated that it has no official attestation.

Thus far Stanford University has been a large college, well ordered for the most part, giving good instruction and with the highest collegiate standards. Its university work, though not extensive, has justly commanded respect.

The present condition of the university does not represent the original aim of the founders nor the ideal of the president. It

has been the necessary result of limitation of funds, the long delay of litigation and the final settlement of the estate, and the recent unwelcome disturbance of the earthquake.

The elimination of these factors makes it necessary to look forward to the future. Is Stanford University to be a college or a university, or a compound of both? In my judgment the last can not be a permanent condition in any of our large institutions. Collegiate instruction is relatively cheap. It is given well in upwards of two hundred institutions in America, and more or less badly in as many more.

University work on a large scale is expensive. If properly undertaken, it is the choice privilege of the few institutions that are generously endowed, or that are the educational pride of wealthy states.

Among these Stanford University must stand. Its great endowment was given for that purpose, and its freedom from outside control enables it to undertake lines of work, and long-continued series of investigation, efforts of the highest intellectual type, which would not find support in public institutions with their natural tendency towards the demanding of immediate results.

In 1892 Governor Stanford said repeatedly that he wanted this institution to combine the technical work of Cornell University with the highest post-graduate work or work of investigation, at that time represented by Johns Hopkins University; that he wished it to be a university in the highest sense, "beginning," to use his own words, "where the state university leaves off." I may say in passing that at that time the University of California was chiefly an undergraduate college. In its present expansion, it has largely begun where it then "left off," and we may admit that it has already gone much farther in the realization of the ideals of Governor Stanford than Stanford University has yet gone. But we have time before us, and most things are possible with time and patience.

To make a university, in the world-sense, of Stanford University the following elements seem to me essential:

The elimination, as soon as possible—let us say in the course of five years—of the junior college, by the addition of two years to the entrance requirements. This need not necessarily raise the requirements for the bachelor's degree, which would then be, as now, two years of approved university work beyond the work of the junior college. These requirements are high enough. There is much to be said in favor of lowering them to the level of completion of the junior college course. This would correspond to the bachelor's degree of twenty to thirty years ago.

With this should follow the extension of the university as such and the intensification of the higher work. Especially medicine should be added to its scope of instruction, and other lines of advanced work would naturally follow if the university were relieved from the burden of elementary instruction—of work which is done more or less well in every part of the country.

Unlike the German universities the American universities must include instruction in the various professions of engineering. This is in Europe generally relegated to a separate institution, the Polytechnicum. The development of the creative phases of engineering is costly, and yet of the highest importance to the material progress of the country. Besides the increase of equipment, the library must be greatly enlarged, a process at present going on at a generous rate. It will also be necessary to provide adequate means for the publication of results of scientific,

literary and other forms of research. The means for beginning this work have been already provided by your honorable board.

It will also be necessary to provide means for fellowships and scholarships. The present writer has been strongly opposed to the present fellowship system in America, believing that its evil of hiring men to study in a certain place often outweighs its advantage of furnishing promising men with means of making the most of their period of training. But in a matter of this kind it is not possible for a single institution to stand aloof from its associates, and to demand an adequate return in laboratory or other assistance from each fellow will tend to minimize these evils of the system.

SCIENTIFIC BOOKS

Anatomy of the Brain and Spinal Cord, with Special Reference to Mechanism and Function. By Harris E. Santee, M.D., Ph.D. Fourth edition, revised and enlarged. Philadelphia, P. Blakiston's Son & Co. 1907.

In this fourth edition, Dr. Santee has so enlarged upon the previous editions as to make a book of 451 pages, including an excellent index, and has added a considerable number of illustrations. His confessed endeavor has been to present the present knowledge of the anatomy of the human central nervous system. To do this, he states that he has gleaned, as far as possible, from "original sources" and he gives special credit to the works of McMurrich, Cunningham, Morris's "Anatomy," the reference books of Barker, and to Dr. A. W. Campbell's recent "Histological Studies of Cerebral Localization."

Published in this country, we already have an exhaustive compendium of the literature up to that time, in Barker's "Nervous System" and, in its contemporary, the work of Gordinier, we have a very excellent and serviceable text-book. Dr. Santee's book is less exhaustive as to the anatomy of the nervous system than either of these and one of its aims is to include added findings which go to make up the present status of our knowledge. It is designed as a text-book for medical students primarily. In the preface it is stated that the special objects in view throughout the book are the "location of functional centers and the tracing of their afferent, associative, and efferent connections." Attention is very wisely given, in the general text, to the embryology when such will aid the student in comprehending the adult structures, and, at the end of the book, a special chapter is wholly devoted to the origin and differentiation of the brain and spinal cord.

In arrangement of subject-matter, the author has presented the structures in the order which he thinks convenient to the dissector, though the book is manifestly for use, not in the dissecting room, but in the laboratory, where properly hardened (and therefore long removed) brains and spinal cords may be used, supplemented with the study of stained sections under magnification. The order begins with the meninges of the encephalon, then passes to the cerebrum and rhombencephalon with their various subdivisions, then takes up the meninges of the spinal cord, followed by a study of the cord itself, and ends with a chapter on the tracing of impulses and the chapter on embryology.

While the dura mater of the base of the cranium almost of necessity has to be studied in the dissecting room, the spinal cord is more easily and safely removed with its dura intact, and usually it is thought that all the membranes are best studied and their significance better grasped while, or after, studying the superficial characters of the structures they envelope. In the study of related mechanisms, it is usually considered pedagogically wisest to proceed from the simpler to the more complex structures. The spinal cord, being much less voluminous and its architecture much more easily grasped, as well as having functional precedence in most of the activities of the general body, is considered first by the student in most laboratories.

In the total 128 illustrations, Dr. Santee has displayed good judgment in the choice of those taken from other works, fifty-three of

these being taken from McMurrich, Gordinier and Morris's "Anatomy" alone. In a few cases, however, the choice is not so fortunate. For example, in Fig. 51, taken from Burbaker, there are four anatomical misrepresentations. Some of the illustrations labeled "*original*" but little resemble anything found in nature; others of these are strikingly familiar.

The period of transition from the use of the old polyglot nomenclature into that of the BNA is rapidly passing and Dr. Santee has adopted the BNA quite extensively. It would have been amply justifiable and highly commendable had he used the BNA consistently throughout his book, confining himself either to the original Latin terms or to their English equivalents as he preferred. The marked inconsistency with which he uses the nomenclature often gives an impression of crudeness which is unfortunate. In the headings of the paragraphs, often one heading is in the BNA, followed by one or two in the English equivalents of the Latin for no obvious reason, and then may follow a heading in neither the BNA nor its equivalent. Occasionally there is a split use of Latin and English, such as "*columna of the fornix*," "*anterior columna*" (of the spinal cord). The lay-term, "*gray matter*," "*white matter*," is frequently used instead of the much more satisfactory BNA term, *gray substance;* and the gross divisions of the longitudinally running fibers of the spinal cord are referred to as *columus* instead of using the more expressive BNA term *funiculus,* a bundle of bundles (fasciculi). The posterior median sulcus of the spinal cord is given the old misnomer of *fissure* when it does not become a fissure, nor is it so called in the BNA, until the medulla oblongata is reached. On the other hand, certain BNA terms are used which are now quite commonly modified by anatomists; for example, *posterior* and *anterior* instead of the much preferable *dorsal* and *ventral* roots, etc. The term, *cerebral nerves,* might be satisfactorily modified by substituting with the word, *cranial* or *encephalic,* since only four of the twelve pairs, including the questionably typical optic nerves, are attached to the cerebrum. Also, such terms as "*rubro-spinal tract*," "*relay stations*," and "*excito-reflex fibers*" are crude as well as unsatisfactory, and such an expression as "*Ganglionar Gray Matter of the Cerebellum*" is a rather indefinite way of designating the cerebellar nuclei and smacks of tautology as well, since, strictly speaking, all nervous gray substance is ganglionic and all ganglia are gray substance.

The descriptive anatomy, especially that pertaining to the contours and macroscopic features of the central nervous system, is excellently good and is gone into with considerable detail. The finer microscopic and the functional anatomy can not be so generously accepted throughout. From the nature of the subject, no author can deal with the detailed functional significance of the various structures of the nervous system, especially those of the encephalon, in a way acceptable to all readers.

The description of the neuroglia is wholly that given prior to the year 1895.

For more than twenty years it has seemed to be the ardent desire of practising physicians to divide the prosencephalon into isolated, definitely bounded, functional "*centers*." Dr. Santee has apparently accepted without question a large number of the conclusions with which this literature is filled and states them with a positiveness often more or less unwarranted for the purposes of a text-book. There are given boundary distinctions between questionably separate "*emissive motor centers*" and "*psychic motor centers*," "*receptive common sensory centers*" and "*psychic common sensory centers*," and instead of the more elastic term, *area,* we are given definitely the location in the cerebral cortex of a *speech center,* a *writing center,* a *center of stereognosis,* an *intonation center,* a *naming center,* a *center of abstract concept,* etc. The word *psychic,* qualifying the name of a "center," makes it more admissible, for this word may imply any multitude of phenomena whose nature, extent and functional anatomy are not understood. The more conservative works think it wiser to confine definite statements as to cerebral localization of function to those *areas* of the cortex which, by direct

experimental or traumatic stimulation, or by repeated cases of identically similar lesions, are definitely indicated to be concerned with the given functions. The general motor and sensory (somæsthetic) *areas* are known with practical certainty, and experiments have enabled us to subdivide them for different parts of the body; and the areas concerned more than any others with the four special sense organs are generally accepted, though not given definite boundaries. But to go much further, our knowledge will have to advance past the stage, not yet reached, when cerebral tumors may be positively diagnosed both as to existence and especially as to exact position, and when positive interpretations may be made of the varied symptoms accompanying many of the smaller brain lesions.

Further, purely histological studies of cerebral localization are practically worthless as to the existence of "centers." The function of an organ or part of an organ must be previously known, for function can not be inferred from anatomy. With microscopic anatomy especially, one would be more helpless than, for example, he would be with a steam engine or its parts, unknown and seen for the first time. Just as the leaves of a tree are not exactly alike, so are no two gyri, of the same or of different cerebra, exactly alike as to contour, depth of sulci or thickness of pallium. These superficial differences are as marked as internal or structural differences. If analyzed far enough, no two sections of a gyrus will be found identical and, by carefully comparing sections of adjacent gyri, differences of structure are easily distinguishable. All gyri peculiarly situated, and therefore peculiarly shaped, show peculiar structural differences. If a well-defined difference of function of a whole or a part of an organ is positively known, functional significance may then be assumed and attributed to the structural differences, and such assumptions may or may not be correct as the history of the study of many organs shows. Many of the differences in number, size and lamination of the cell bodies, and therefore of the axones, of the various gyri may be more truly explained as due to different intracranial physical conditions present during the processes of growth. The existence of the gyri and their superficial differences are explained in this way.

The execution of the book is fine. The paper is good, the print neat and clear, and the reproduction of the illustrations is excellent.

The intent of a book of this kind is to aid the student in making a more detailed study of the nervous system than is expected with the ordinary text-books of anatomy. Dr. Santee will agree that in making such advanced studies, the student should be urged in every possible way to consult frequently the literature of the subject, yet, no bibliography is given nor is there given an index of authors consulted during the preparation of the book.

Irving Hardesty

Berkeley, California

Introduction to Higher Algebra. By Maxime Bôcher, Professor of Mathematics in Harvard University. Prepared for publication with the cooperation of Mr. E. P. R. Duval, Instructor in Mathematics in the University of Wisconsin. New York, The Macmillan Company. 1907. Pp. xi + 321.

Analytic geometry is one of the most useful solvents of algebraic difficulties. Among other important solvents of compounds of higher algebra are the group theory, the differential calculus, and the theory of numbers. In the present work analytic geometry is so frequently employed that a good elementary knowledge of this subject is an indispensable prerequisite. Group theory is used very much less frequently and the necessary concepts of this subject are developed very briefly but clearly. The Galois theory of algebraic equations and the explicit theory of congruences are entirely omitted and invariants are treated very briefly. The omission of such important matters seems justified by the title, as it is not intended to be a compendium, but really an introduction to higher algebra.

The reader should, however, not get the impression that he is dealing with a work which is like other so-called higher algebras pub-

lished in this country. On the contrary, Professor Bôcher's book bears closer resemblance to Weber's "Lehrbuch der Algebra" or Serret's "Cours d'algèbre supérieure" even if it is much less comprehensive than these classic works. It exhibits the same masterly grasp and improvements in the presentation of fundamental matters. For instance, the theory of linear dependence is treated here in a more complete and satisfactory manner than in any other text-book. Another special feature of this work is the thorough treatment of quadratic forms, culminating in the important but not easily accessible theory of elementary divisors.

The book is intended "for students who have had two or three years' training in the elements of higher mathematics, particularly in analytic geometry and the calculus," and is based upon the courses of the author's lectures delivered at Harvard University. The mode of treatment is in accord with the modern tendency not to be satisfied with results which are true "in general"; that is, which are true except in some isolated cases. In using such results it is always necessary first to inquire whether the case to which we desire to apply them is not really one of the exceptional ones, and hence they are very much less desirable than the theorems which have no exceptions. This mode of treatment is a consequence of the effort to actually prove things instead of being content with some more or less plausible intuitions which so often pass for proofs. The scope and contents of the work may be inferred from the following list of the headings of its twenty-two chapters; Polynomials and their most fundamental properties, a few properties of determinants, the theory of linear dependence, linear equations, some theorems concerning the rank of a matrix, linear transformations and the combination of matrices, first principles and illustrations of invariants, bilinear forms, geometric introduction to quadratic forms, quadratic forms, real quadratic forms, the system of a quadratic form and one or more linear forms, pairs of quadratic forms, some properties of polynomials in general, factors and common factors of polynomials in one variable and of binary forms, factors of polynomials in two or more variables, general theorems on integral rational invariants, symmetric polynomials, polynomials symmetric in pairs of variables, elementary divisors and the equivalence of λ-matrices, the equivalence and classification of pairs of bilinear forms and of collineations, the equivalence and classification of pairs of quadratic forms.

G. A. Miller

University of Illinois

SCIENTIFIC JOURNALS AND ARTICLES

The Journal of Experimental Zoology, Vol. V., No. 2 (December, 1907), contains the following papers: "Regeneration of Compound Eyes in Crustacea," by Mary Isabelle Steele. The small hermit crab (*Eupagurus longicarpus*), the shrimp (*Palæmonetes vulgaris*) and the sand shrimp (*Crangon vulgaris*) were used for experiment material. Each individual had either a part or the whole of one or both eyes removed. Results obtained after removing part of the eye show: that hermit crabs may regenerate a perfect eye even after the destruction of as much as half the optic ganglion; that *Palæmonetes* does not regenerate an eye if the optic ganglion has been at all injured; and that *Crangon* regenerates an eye much more slowly than either of the other species, and only after little or no injury to the optic ganglion. After removal of the eye so that the entire optic ganglion is destroyed, the hermit crabs and *Crangon* may regenerate an antenna-like organ in place of the excised eye. *Palæmonetes* does not show any sort of true regeneration unless the optic ganglion has been left intact. The results of the whole series of experiments tend to show that the regeneration which takes place from any level is largely influenced by the presence or absence of the whole or a part of the optic ganglion. "On Some Phenomena of Coalescence and Regeneration in Sponges," by H. V. Wilson. Cells of siliceous sponges (*Microciona*) when separated by pressure from the skeleton are able to recombine, forming a plasmodial mass which differentiates anew

into a perfect sponge. "Equilibrium of Animal Form," by Hans Przibram. "The Effect of Degree of Injury, Successive Injury and Functional Activity upon Regeneration in the Scyphomedusan, *Cassiopea Xamachana*," by Charles Zeleny. The present study is a part of a series of experiments whose object is the investigation of some of the internal factors controlling regeneration in several representative forms. It is found that removal of six of the eight oral arms in *Cassiopea* constitutes the most favorable degree of injury for the regeneration of each arm, and that from this optimum there is a decrease in both directions. The data for successive injury show a greater rate of regeneration of the margin of the disk after the second removal than after the first. A comparison of the rate of regeneration of the margin in cases where the disk was made to pulsate rhythmically with cases without pulsation shows no advantage in favor of the pulsating ones, but rather a retardation. "Studies in Adaptation—I., The Sense of Sight in Spiders," by Alexander Petrunkevitch. This article shows the relation between the position of the eyes on the cephalothorax and the particular locomotion in hunting spiders, and by the application of a new method makes possible the determination of the maximum angles and of the limit of vision for each eye.

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 200th meeting of the society, held in the Cosmos Club, on Wednesday evening, February 12, the following papers were presented:

Regular Program

The Barringer Hill (Texas) Pegmatite Dike: Frank L. Hess.

This dike by its resistance to erosion has formed a low hill in the flood plain of the Colorado River, and was named for the discoverer. The minerals of the dike have unusually large dimensions, the quartz occurring in masses 40 feet in diameter; the feldspar in masses 30 feet across, with individual crystals having edges 34 inches long; while fluorite crystals enclosed in quartz show edges a foot long. A great variety of rare-earth metal minerals occur in the dike, of which the yttria bearing minerals, fergusonite and gadolinite are mined commercially. Allanite occurs in masses weighing over 300 pounds, fergusonite up to 65 pounds and gadolinite up to 200 pounds. So far, no other important occurrences of the rare-earth metal minerals have been found in the neighborhood.

The Structure of the Marble Belt of Fannin County, Georgia: Laurence LaForge.

The marble occurs in two lines of exposures, occupying a double valley from one to three and one half miles in width, cut about 250 feet below the general level of the region, and with a low central ridge of mica slates. Owing to strike faults, there is not a complete section, nor do the formations occur in complete normal sequence anywhere in the immediate region, and attempts to unravel the structure were unsuccessful until the key was furnished by the sequence of the formations determined by Mr. Keith in the Nantahala Quadrangle in North Carolina.

The structure shows the valley to be in general synclinal, but with a subordinate axial anticline, the two lines of marble thus occupying the lateral synclinal axes, and the slate of the central ridge belonging in a formation underlying the marble. Both the central anticline and the lateral synclines are broken by thrust faults, so that the marble occurs in discontinuous patches, and on the western side of the valley one and sometimes two of the underlying formations are faulted out. Nothing is known of the actual dip of the faults, but certain considerations lead to the conclusion that they are steeply inclined, and that the western fault is overthrust from the west, the other two being overthrust from the east.

Oxygen Values and Coal Alteration: Mr. David White.

Elimination of oxygen is the preeminently important feature from the standpoints both of coal efficiency and coal development. This deoxygenation, largely accomplished during the first or biochemical (putrefaction) stage of coal formation, continues during the second,

or dynamochemical stage. A comparative study of ultimate analyses shows that in practically all kinds of coals, the oxygen and the ash are of approximately equal anti-calorific value, *i. e.*, of nearly equal importance as impurities from the heat standpoint. Consequently, since the carbon-oxygen ratios of coals with the same ash closely correspond in their numerical sequence to the order of the calorific values of those coals, it follows that coals with varying ash will, if arranged according to the ratios of carbon divided by oxygen-plus ash, $C \div (O + Ash)$ stand in a sequence closely approaching that of their calorimetrically ascertained efficiencies. Of 250 coals tabulated in accordance with the latter ratios few depart as much as three per cent. from the mean corresponding to their respective ratios, and the greater number are within one per cent. The widest departures are found among the brown lignites and peats and the coals undergoing anthracitization. The comparative study shows that the anti-calorific value of the oxygen is apparently about twice as great as has been supposed. In fact, per cent. for per cent., oxygen and ash as impurities are of so nearly equal value according to the calorimetric tests of the coals as to be practically interchangeable so far as concerns the heating power of the fuel. Since the demonstration is based upon the analyses of the air-dried samples in which the water content varies widely, it would appear that the oxygen of the moisture is not far different in anti-calorific value from that of the oxygen in hydrocarbon combination. The negative value of one per cent. of oxygen, or ash, in ordinary bituminous coals is probably between 70 and 80 calories.

A further study of the analyses suggests that the quality of coking may be due to the presence of gelosic algal, or sapropelic, matter in the original ingredients of the fuel. Since fuels in which such matter has been microscopically observed generally fuse, usually with swelling, on combustion; and since the researches of Renault and Bertrand have proved the agency of gelatinous micro-algæ in storing up bitumen, it would appear probable that coals possessing the necessary quantity of such ingredients would exhibit both fusibility and enrichment by bitumen. Consequently, fuels which are shown by a relatively high per cent. of hydrogen to have been enriched by bitumen, if such enrichment is due to the presence of the above mentioned ingredients, will also possess the fusibility essential to coking, provided that the ash is not too great. The comparative study of the analyses shows that, until the point of rapid dynamic devolatilization of the semi-anthracitic stage is approached, coals which exhibit a high proportion of hydrogen as compared to oxygen (H/O) and which, therefore, may be regarded as enriched by bitumen, generally possess coking fusibility. It thus appears that the above hypothesis is supported by chemical analyses, although it may not be regarded as proven short of microscopical detection of gelosic (sapropelic) elements. In the main body of coals, between semi-bituminous and lignites, it would seem possible to forecast the coking quality from the hydrogen-oxygen ratios, moisture-free basis, of the coals.

Philip S. Smith,
Secretary

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

The 646th meeting was held February 29, President Bauer presiding.

Mr. John E. Burbank presented the first paper of the evening, entitled "Microseismic Tremors and their Apparent Connection with Barometric Variations."

This paper discussed a now well-known type of seismic motion which consists of short period waves of very small amplitude, lasting, generally, for hours and sometimes for three or four days. These waves show alternate maxima and minima like the phenomena of beats in acoustics.

The seismograph at the Cheltenham Magnetic Observatory recorded 75 cases between September 1, 1906, and January 31, 1908. The most pronounced tremors occurred when a deep barometric depression passed from land to sea, or *vice versa*. No marked depression passed over the coast line, between Portland, Me., and New Orleans, La., during this in-

terval of time without being accompanied by tremors which were recorded at Cheltenham. When the center of a depression passed over the coast line near Cheltenham the tremors were much more pronounced. These tremors also occurred, but with less intensity, when a pronounced high area passed over the coast line. They also occurred when the barometric changes were such as to cause sudden pressure changes over a large extent of coast line. No tremors accompany barometric depressions or sudden changes which take place wholly over land, even when comparatively near Cheltenham. The period of these minute waves is about 3.3 seconds and has no definite relation to the periods of the pendulums themselves, which varied between 18 and 28 seconds. Two cases were noted when the period was 5.0 seconds.

It was pointed out that a barometric depression when over land ought to raise the earth's surface on account of the reduced pressure, and when over the ocean the water should rise so that the pressure on the ocean bed would be practically unchanged. Any load applied to, or removed from the earth's crust by a barometric change would have an abrupt margin at the shore line.

At the conclusion of Mr. Burbank's paper Mr. W. J. Humphrey presented two papers; the first paper being entitled "Anode and Cathode Arc Spectra."

In the case of direct current arcs the spectral analysis of the light from the regions of the two poles gives very different results. When the carbons contain only small amounts of metals or their salts the metallic lines are practically confined to parts of the arc near the negative pole, while the carbon or cyanogen bands are most pronounced near the positive pole. This difference has been ascribed by some observers to a kind of electrolysis in the arc, causing an accumulation of the metallic particles on and about the negative pole. Others have considered it due to a similar accumulation of the metallic particles, due not to electrolysis, but to distillation, and to convection.

The author does not accept any of these theories as being both necessary and sufficient to fully account for the phenomena observed. He accepts the theory, largely due to J. J. Thomson, that the arc consists mainly of negative corpuscles moving with great velocity from the negative to the positive pole, together with an approximately equal number of positive ions moving much slower in the opposite direction. Ionization takes place mainly next the positive pole, and the positive ion or "rest-atom" drifts under the voltage of the arc towards the negative pole, where presumably the corpuscles are most numerous and have their greatest velocity.

The shocks then of these "rest-atoms" by the swiftly moving corpuscles is supposed to be the cause of the spectrum lines, which are concentrated about the negative pole simply because this is the place where the corpuscles are most numerous and most energetic.

Mr. Humphrey's second paper was devoted to the subject "The Luminous Particle a Strong Magnet."

Attention is called to the fact that, so far as we know, a magnetic field can act only on some other magnetic field; that an electric current is accompanied by a magnetic field; and that a moving electric charge is an electric current. From this it is argued that the luminous atom, whose spectral lines are changed by a magnetic field, must have a magnetic field of its own, due to negative corpuscles in some sort of orbital motion.

Attention is also called to the fact, shown by Langevin, that a ring of electrons or corpuscles when acted on by a changing magnetic field will correspondingly change its angular velocity, but not its orbital radius. This supposedly leads to a fixed self-induction for the ring, and makes it possible to calculate the electromotive force generated in the ring by any given change in the magnetic field in which the atom chances to be placed, and also the resulting current.

If the atom is constructed in general as the above experimental facts would lead us to believe, then the change in wave-length of a spectral line, when produced in a magnetic field, will bear the same relation to the undis-

turbed wave-length that the strength of the disturbing magnetic field does to the field of the atom itself.

This gives at once the experimentally established Zeeman law, that the change in wave-length, divided by the strength of the disturbing magnetic field times the square of the undisturbed wave-length, is a constant; and, by substituting known values for three of the four terms, the magnetic strength of the atom is found to be some thousands of times that of the most powerful electromagnet.

R. L. Faris,
Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

The 440th meeting was held February 22, 1908, President Stejneger in the chair.

Dr. B. W. Evermann read a paper on "Testing the Water of Small Lakes for Oxygen." The U. S. Bureau of Fisheries has for several years been devoting a portion of its appropriations to the physical and biological survey of the streams and lakes of the states and territories.

These surveys have been directed primarily to the securing of accurate knowledge regarding the fishes and other animals native to each stream or lake, the physical and biological conditions under which they thrive, and the fitness of the waters for other species whose introduction is or may be proposed.

Recently, the bureau began the examination of small lakes with particular reference to the amount of absorbed oxygen contained in their waters. Several such lakes have been examined in Wisconsin (in cooperation with the Wisconsin Natural History Survey) and several in northern Indiana. At Lake Maxinkuckee, besides dissolved oxygen, temperature and depth, the determinations included titrations for normal carbonates, bicarbonates and free carbonic acid. The surface water for a depth of a few meters was about air-saturated with oxygen. Below six meters the oxygen falls rapidly and at twelve or thirteen meters disappears entirely from the water. The dead plankton falling from the upper strata is sufficient to keep the oxygen in the depths consumed by oxidation. Protection from storms and winds which agitate the water is a factor in the lack of oxygen in such lakes.

Dr. C. Dwight Marsh referred to the effect of wind in the distribution of oxygen in lakes. While one class of lakes are shallow and hold oxygen at all depths, and another are deep and have no oxygen in the depths, there is still a third class which are deep and yet contain oxygen at their greatest depths. This last class consists usually of lakes which by their large size or exposure favor the creation of bottom currents originating in the action of wind, as by the piling up of water at one end of the lake, and the subsequent return of equilibrium.

Mr. A. H. Howell read the next paper, which was on "The Destruction of the Cotton Boll Weevil by Insectivorous Birds." This paper was based in part on Bulletins of the U. S. Department of Agriculture and in part on unpublished material. His subject was illustrated by lantern slides and by the skins of the weevil-eating birds. In reply to questions, Mr. Howell said the cotton caterpillar, itself an enemy of the cotton boll weevil, was eaten and preferred to the latter by the birds, and that the weevil, though a tough chitinous insect, was probably digested within a few hours in the stomachs of birds.

Dr. Evermann said Mr. Howell's paper emphasized the necessity of international control of migratory birds. The enactment of the Shiras bill affecting birds, mammals and fishes would be a step in this direction.

The third paper was by Mr. F. V. Coville, on "A Mistletoe Destructive to the Douglas Fir."

M. C. Marsh,
Recording Secretary

THE BOTANICAL SOCIETY OF WASHINGTON

The 46th meeting was held February 1, 1908. Vice-president C. V. Piper presided and thirty-five members were present.

The first paper was by Mr. W. J. Spillman: "Five Types of Variation under the Chromosome Theory." Mr. Spillman started with the assumption that the development of the

individual from the fertilized egg is a matter of the assimilation of food and the conversion of food materials into tissues; and that if we understood all the metabolic processes that occur in the body we might possibly be able to understand why a given egg develops into a specific organism. At present we do not know a great deal about the exact locality in which various processes occur or the cause or nature of the changes which do occur, but there are reasons to believe that the chromatin is of highest importance in assimilatory processes. The cytoplasm also, at least in some of the cells of the body, must also take an important part. Inheritance is easier to understand than development. The gamete, composed of certain substances built into more or less definite structures, is so organized that by assimilation of food the cell is able to reproduce itself. Important differences frequently appear when we pass from one generation to the next.

1. One of the most important, and by far the most common cause of variation, lies in the new groupings of hereditary characters which occur when two gametes unite, the preparation for the new grouping having been made in the formation of the gametes. Any definite structures in the cell which have important functions in the metabolism of food and which retain their identity in passing from one cell to another may determine important differences between parent and offspring. The facts of Mendelian inheritance indicate that there are such definite structures which become rearranged with the production of new gametes and their subsequent union. We may include here all variation due to recombinations of Mendelian unit characters.

2. The definite structures of the cell, which because of their composition bear definite relations to metabolic processes, may, by change in composition or in environment, change in their relation to the metabolic processes. Speaking in a general way, the development of the numerous varieties of domesticated species seems to have arisen from the loss of functions formerly possessed by definite structures within the cell, perhaps in the main the chromosomes. The author, to support this supposition, gave illustrations of the variation in color in domesticated hogs, and called attention to de Vries' application of the same theory to explain the origin of the numerous varieties of cultivated plants.

3. New functions may be acquired by cell organs causing new characters to appear. It is supposed that evolutionary progress in the main is of this character. Such changes may be slow and gradual or instantaneous.*

4. Change of environment may cause marked changes, as in the case of the cassava plant, which loses its prussic acid when brought from the tropics to Louisiana. Hard wheat taken to the Pacific coast becomes soft in a few years. Champion tomatoes from seed grown in Pennsylvania produce Champion tomatoes in Louisiana, but the seed produced in Louisiana yield a very different type of tomato. These variations are probably due to changes in metabolic activities, perhaps in the chromatin and in the cytoplasm. Such changes may be reversible or not. This particular phase of variation offers to the student an inviting field in which too little work has been done.

5. Loss or gain of chromosomes resulting from accidents in cell division may cause important variations. Recent investigation indicates that we may find here an explanation of the so-called mutations of de Vries.

Professor Spillman's paper was followed by a prolonged discussion.

The second paper, "A Root Disease of Tobacco," by Mr. W. W. Gilbert, was an account of the disease caused by the fungus *Thielavia basicola,* which is the subject of a forthcoming bulletin of the Bureau of Plant Industry.

Under the title "Some Peculiar Seedlings" Professor J. B. S. Norton described a series of experiments in germinating immature seeds of the cowpea. From the time of fading of the flowers he collected seeds at intervals of three days. He found that those which were three weeks from the seed, about one tenth normal size, sprouted and produced slender but normal plants.

Mr. J. H. Painter, of the United States National Museum, then gave an account of

"The Present State of the Study of the Flora of the District of Columbia."

The last paper on the program was by Mr. Charles J. Brand, of the Bureau of Plant Industry, who discussed a new variety of alfalfa (*Medicago sativa* L. var. *polia* Brand) based on plants grown from seed of Peruvian origin, quite distinct from forms of the species hitherto known. Inasmuch as the plant promises to be of considerable agricultural importance, Mr. Brand raised the question of the desirability of applying varietal names in the taxonomic sense to distinct forms of our important crop plants. The paper, which included a discussion of previously recognized varieties, aroused an interesting and spirited discussion.

W. E. Safford,
Corresponding Secretary

THE TORREY BOTANICAL CLUB

The club was called to order on February 26, 1908, at the Museum of the New York Botanical Garden at 3:45 P.M. Ten persons were present.

The scientific program was as follows:

Remarks on the Genus Boletus: William A. Murrill.

This paper will be published in the March (1908) number of *Torreya.*

Some Fern Hybrids: Ralph C. Benedict.

The object of this paper was to present general facts regarding fern hybrids, to indicate the apparent significance of the facts, and to show examples of some native hybrids.

The literature on the subject seems to be very scanty, and consists principally of scattered descriptions of natural and horticultural hybrids. Lowe ("Fern Growing") has given a general discussion of the subject, but his work is of a horticultural, rather than of a scientific, value. The most conclusive experiments are those carried on by Miss Margaret Slosson, in which she reproduced culturally *Asplenium ebenoides* (*A. platyneuron* × *Camptosorus rhizophyllus*) and *Dryopteris cristata* × *marginalis* Davenport, two suspected hybrids, which occur in nature. Recently, at least one more cross has been artificially produced by Mr. Amedee Hans, of Stamford, Conn., between *Dryopteris Filix-mas* and *D. marginalis*. This, however, has not yet been found wild.

Study of these three authenticated hybrids shows that they agree in general with the hybrids of some flowering plants. They are sterile, usually larger than the parents, sometimes abnormal, and in many characters intermediate to a greater or less degree between the parent species. In view of these facts, it seems reasonable to interpret as hybrids other forms (principally in *Dryopteris*) which are sterile and similarly intermediate between two species.

Some of these are very characteristic and might be considered separate species. At least two have been so described. This view, however, is untenable because of their sterility, and their distribution, rare or occasional with the parent species, or at least in a locality where these grow or have grown. That they are mutations seems very doubtful, because the actual differences are so great, and especially since in these differences they resemble the other reputed parent. For example, sterile intermediates are known between *Dryopteris marginalis* and six other species. Some resemble *marginalis* most, some the other species, but all agree in possessing distinctive characters of each of two species. For similar reasons, these forms can not be satisfactorily explained on ecological grounds.

If it is objected that fern hybrids must, because of the conditions required for the transference of spermatozoids, be too rare to account for these plants which are rather common, it may be said that *Dryopteris cristata* × *marginalis,* one of the authenticated crosses, is the commonest of them all. It may be expected in any swampy woodland where the parent species occur. This being the case, we are bound to expect the other forms to be found at least occasionally, and it seems only logical to conclude that such intermediate sterile forms as are analogous in general characters to *D. cristata* × *marginalis,* belong in the same category, and are likewise hybrids.

In the region in which the writer has studied these plants, *Dryopteris* is represented by six specific units which seem to hybridize more or less readily, representing a total of fifteen possible combinations of two species. Of these fifteen, two are already described. Of the remaining, probably eleven have been found, and descriptions for most of these are in preparation, some by Miss Slosson, some by Dr. Philip Dowell and some by Mr. Benedict.

Both papers were discussed at length.

C. STUART GAGER,
Secretary

THE AMERICAN CHEMICAL SOCIETY
NEW YORK SECTION

THE sixth regular meeting of the session of 1907–8 was held at the Chemists' Club, 108 West 55th Street, on March 6.

The annual election of officers, to assume their duties at the close of the June meeting following, was held with the following result:

Chairman—Leo H. Baekeland.
Vice-chairman—F. J. Pond.
Secretary and Treasurer—C. M. Joyce.
Executive Committee—H. C. Sherman, Geo. C. Stone, Morris Loeb, Arthur B. Lamb.

The following papers were read:

"The Electrolytic Determination of Bismuth," by F. J. Metzger and H. T. Beans.

"Some Principles in Laboratory Construction," by Chas. Baskerville.

"A Method of Analyzing Shellac," by P. C. McIlhiney.

"Studies in Nitration, IV.: Melting-point Curves of Binary Mixtures of Ortho-, Meta- and Paranitranilines: A New Method for the Determination of Such Mixtures," by J. Bishop Tingle and H. F. Rolker.

C. M. JOYCE,
Secretary

DISCUSSION AND CORRESPONDENCE

COOPERATION IN SCIENTIFIC BIBLIOGRAPHY

THE recent report of Dr. H. H. Field, founder of the Concilium Bibliographicum of Zurich, Switzerland, contains a discussion of the relations which this central international agency for recording and making accessible information regarding publications in certain sciences bears to publishers and editors in these fields, which is of wide interest to all who wish to forward the success of this most valuable aid to science.

This bibliographical institute was founded officially by the International Congresses of Zoology and Physiology and for a decade has been subsidized by the Swiss Confederation, the city and canton of Zurich, the Swiss Bureau of Education, the French Zoological Society and learned societies in other countries. It is the work of the Concilium to examine the scientific periodical literature of the world, and also that which appears in reports, memoirs, bulletins of irregular and discontinuous publication, as well as the formal volumes of the regular book trade, and prepare accurate bibliographical lists of the same. The Concilium issues at present a series of bibliographical cards in zoology and another in physiology. The cards in zoology cover also the fields of general biology, microscopy, paleontology and anatomy. To these sciences which lie on the dividing line between medicine and the natural sciences it is intended to add progressively new branches. Movements have been started looking toward the extension of this work into other fields of science and the Concilium has come to be considered as the natural center about which all work of this nature tends to group itself. Alliances are even now being sought by the leading bibliographies in botany, anthropology, geology and mineralogy. Further extensions into the field of medicine are also sought, while negotiations regarding forestry and electro-chemistry are pending. Dr. Field very justly calls attention to the fact that the usefulness of the Concilium in making known new publications is not limited to printed matter appearing under its immediate editorship; to wit, in the "Bibliographia Zoologica" and "Physiologica" and the bibliography cards founded thereon. The work here done is the starting point for the reviews and summaries which appear later in the *Zoologischer Jahresbericht* and the much belated *Archiv für Naturgeschichte*. The recorders of *Zoological Record* and the *Année Biologique* depend also to no small degree upon the Concilium

for their finding lists for the literature reviewed in their annual summaries. "Applied to a practical case, this means that a publisher who sends the Concilium a press copy of a treatise on 'The Reactions of Unicellular Organisms to Light,' for example, insures thereby immediate mention of the work in the card catalogue, the 'Bibliographia Zoologica,' the 'Bibliographia Physiologica' and the bibliography of Protista. He may also be assured that the work will not be overlooked by the annual reviews: *Zoological Record, Zoologischer Jahresbericht, Archiv für Naturgeschichte, Jahresbericht über die Fortschritte der Physiologie, Jahrbücher der Medizin, Année Biologique*, etc."

The Concilium examines all the literature which it lists in its bibliographies and depends in part for the completeness of its work upon the cooperation of authors, editors and publishers who send their work or publications to its office at Zurich. The Concilium has no funds for the purchase of periodicals or books for this purpose of bibliographical record. It should be noted in this connection that the publication of the bibliographical analysis of a zoological work includes not only the formal listing of the title, but the printing of the names of all new genera, a report upon the number of new species or varieties proposed in its pages, and in some cases a brief statement of the nature of the contents of the paper. Furthermore, the paper or book is cited, it may be, not once merely, but often again for a number of times upon cards, by title, or in the "Bibliographica Zoologica," by number, in connection with each subdivision of the subject upon which the contents of the book or paper touch. For example, a paper upon the "Plankton of the Illinois River" would be cited under the headings of geographical distribution, invertebrata, and it might be under a half dozen or more subdivisions of the animal kingdom. It is thus no small service which the Concilium renders authors and publishers in extending publicity throughout the scientific world by such an extended analysis of the contents of the work. The service which the Concilium renders in this regard saves in the aggregate a large amount of time for the investigators in the zoological and allied fields. It is evident that the completeness of the bibliographies issued by the Concilium and the promptness with which the references are published can be greatly facilitated by a hearty cooperation between the authors, editors and publishers, and Dr. Field's most helpful institution. In discussing this question of cooperation Dr. Field writes as follows:

According to a recent writer (Dr. Vaughan), this preeminence of the Concilium has been won in spite of the fact that in 1901 only 70 per cent. of the world literature (on sponges) was recorded. This percentage may be perhaps considered low; but it must not be forgotten that at that time the Concilium had not solicited in any general way the cooperation of publishers and editors. The material that was sent to Zurich came from those who had casually learned of the work and sent press copies on their own initiative. It is evident that, when the cooperation of publishers becomes more universal, the scientific public and the reviewers will rely still more on the information obtained from the Concilium, so that the usefulness of the agency as a means of publicity will correspondingly increase.

In the early debates regarding the foundation of the Concilium, it was contended that the institution might rely in part on financial contributions from publishers. The project of securing revenue from such a source was, however, deemed impractical, not because the services rendered were too slight to justify soliciting aid, but because of the difficulty of levying contributions. Completeness of the references is essential to the institution and no penalty of exclusion could be put into force against those who declined to give their quota. No work of interest could ever be excluded for fiscal reasons. On the other hand, it was thought unnecessary to provide funds for the purchase of works to be catalogued and no part of the subsidies can be so used. It is definitely assumed that all publishers will be glad from enlightened self-interest to make their publications accessible in Zurich. The Concilium agrees that all matter sent for review shall under no circumstances be offered for sale, so that there is no danger of a single purchaser being lost in consequence of copies sent to us. It is highly desirable that books and periodicals shall be kept by the Concilium for later consultation. In the case of publications with valuable plates, the latter may be withheld, provided they are described in the

text. Expensive works will be returned on request. With octavo publications it is assumed that the request to return "uncut" applies only to the tops of the books, for every page must be accessible to the recorders.

It is quite impossible to explain exactly what classes of books are required for the work. We therefore wish to receive from each publisher his book-lists as they appear. From these we shall make a selection. In cases of doubtful admissibility, we shall order the book for examination. It is, however, understood that, in so doing, we undertake no obligation to cite a work which is not found to fall properly within the scope of our bibliographies.

Already the English publishers have signified their willingness to cooperate and recent visits to a number of American firms elicited an equally favorable attitude. The Concilium has in press a list of some 2,800 periodicals arranged by countries. It is proposed to state for each country, as an appendix to the list of journals received, the publishing firms which maintain regular relations with the Concilium. For this reason we desire each publisher whom this circular may reach to signify his intention of cooperating and his willingness to have his name given in such a list. At the end of each year each publisher will receive cards showing which of his books have been cited. Authors will also further the work if they will assure themselves that their publications reach Zurich. When once the custom is fairly established, it will be found useful to all concerned, and the publisher, while acting in his own interest, will do a great service for the advancement of knowledge.

The preliminary list of the 2,800 periodicals which Dr. Field has published in his present report includes about 450 from the United States. Of these 450 publications of repeated or periodical nature less than 175 reach the Concilium regularly. The other 275 must be consulted elsewhere, if at all, or written for with resulting increased cost and loss of time, or one must depend on the chance courtesy of the individual authors. A cursory inspection of the list of the American journals which are "insufficiently easy of access" to the Concilium includes many medical journals of the subscription class, but by no means all of such journals, a surprisingly large number of the research publications of our universities, such, for example, as the "Bryn Mawr Monographs"; "Biological Lectures of Woods Holl"; "Bulletin of the Laboratory of Natural History, University of Iowa"; "Bulletin, Syracuse University"; "Columbia University Biological Series"; "Memoirs of the Biological Laboratory, Johns Hopkins University"; "Princeton University Patagonia Expedition"; several series issued by the University of California, and others. Some of our oldest and most widely known learned societies, as well as more recently organized ones, are not on the list of fully cooperating institutions, such, for example, as the American Philosophical Society, the Linnean Society of New York, the New England Zoological Club, Essex Institute, and the Philadelphia, Chicago, Michigan, Ohio and Kansas Academies and even the National Academy of Sciences at Washington. Many of our agricultural experiment stations fail to send the publications and even the Biological Survey, Bureau of Animal Industry and some other bureaus of the Department of Agriculture at Washington are not fully cooperating. In like manner many of our state natural history and geological surveys and boards of agriculture which publish more or less matter which falls within the scope of the bibliographies of the Concilium fail to send their publications.

An opportunity to advance the cause of science is here afforded to all American publishing agencies, and to American publishers to bring their publications very effectively and in permanent form before scientific workers throughout the world. It is to be hoped that the spirit of cooperation which has dominated the Concilium from its foundation will be extended more widely among our American institutions and that individual workers in the various biological and medical fields will take pains to see that all serial publications in their control are sent regularly in the future to the Concilium Bibliographicum, Zurich, Switzerland.

CHARLES ATWOOD KOFOID
UNIVERSITY OF CALIFORNIA,
February 28, 1908

THE INHERITANCE OF FLUCTUATING VARIATION

DR. R. P. BIGELOW has asked,[1] how I would

[1] SCIENCE, January 31, 1908, p. 192.

account for the correlation between parent and offspring in characters subject to fluctuating variation, if such variations are not transmitted. In reply to this I wish to say, that *I do account* for this by the assumption of hereditary transmission: however, such cases should be carefully ascertained, preferably by experiment, in order to remove all reasonable doubt as to the fact of the reappearance, in the offspring, of such fluctuating variations, which appeared first in the parents.

I have expressed the opinion that *normally*, in fluctuating variation, this will not be the case, simply because it is to be assumed that the cause of the fluctuating variation will not persist through many generations, so that any tendency toward inheritance, even if present, will soon be counterbalanced and paralyzed by the opposite tendency of variation. Permanent, hereditary variations are only to be expected if the variation of the environment keeps on in the same direction, that is to say, when it ceases to be a "fluctuation," and becomes a "mutation" (in von Waagen's sense).

Recently, Dr. D. T. MacDougal[2] has proposed to settle the question of "inheritance of acquired characters" by experiment, and, *by restoring at the end of the experiment the original conditions*, he intends to show "whether the changes in question are irreversible or not." However, I do not think that the "inheritance of acquired characters" will be disproved, when the effect of the changed conditions "finally disappears, when the inciting causes are removed." Indeed, *this should be the case*. MacDougal hints at the existence of examples, in which the "effect endures for a few generations," and this is all we reasonably may expect under such conditions; and if the experiment has been made on scientific lines, we are fully justified to quote such cases in support of the "inheritance of acquired characters."

MacDougal (p. 122) finds that the phrase "inheritance of acquired characters" is so vague that he has difficulties in properly defining it. But the conditional definition he gives, that it might mean "that an organism makes *adaptive*[3] response to its environment . . . and that the continuance of the stimulus . . . results in heritable and *irreversible*[3] modifications" is surely incorrect. To my knowledge, none of the advocates of the theory of the "inheritance of acquired characters," in its modern form, ever expressed the opinion that the responses of an organism to the environment are always "adaptive," or that they are "irreversible," when transmitted. The phrase "inheritance of acquired characters" does not need any special definition, since it means exactly what the words say, and since none of the words has an ambiguous meaning, preeminently so in its application to biology.

A. E. Ortmann

Carnegie Museum,
Pittsburg, Pa.,
February 10, 1908

[2] Science, January 24, 1908, p. 123.

[3] The italics are mine.

TO REDUCE SEASICKNESS TO A MINIMUM

Reduce the system to an alkaline condition. This must be done under the advice of a physician. The urine must be tested two or three weeks before going on board ship. The normal urinary acidity is from thirty to forty degrees. If below thirty, the acid is not eliminated. If above forty, the kidneys are not carrying away all that is in the system. In either case it should be reduced by giving saline waters and antacid treatment. The indican, if any, must also be reduced. Clean out the system thoroughly. Before going on board ship or before the ship leaves the dock, take a strip of soft flannel about six inches wide and three yards long, wrap it around the abdomen and stomach tightly. This will prevent the movement of the internal organs which affect the nervous system. Eat little on board ship and avoid all acids, fruits, salads, beers, wines, etc. Those persons having acid diathesis must not drink lemonade, tea or coffee. Hot water is to be preferred.

Eugene S. Talbot, M.D.

SPECIAL ARTICLES

COMPETITIVE ATHLETICS AND SCHOLARSHIP

One of the most important considerations for schools and colleges in this whole problem of athletic control is that of scholarship.

This paper is an attempt to answer some of the questions which have arisen regarding the scholarship of students on teams representing educational institutions and the effect of competitive athletics on scholarship. It will also endeavor to show what are some of the causes which produce this result and to suggest remedies therefor.

The materials were largely collected in 1898, but no use was made of them until December, 1905.

The questions which will mostly concern us are: (*A*) Is there a material difference in scholastic standing between the students who represent our schools and colleges on athletic teams and those who do not? (*B*) If there is such a difference, whether in favor of or against the athlete, is it due to competitive athletics immediately or remotely, or to the natural mental powers, or disposition of athletes? (*C*) If there is a material difference, whether due to competitive athletics or natural powers, what should be our attitude toward it? The major part of this paper will be devoted to matters of fact indicated in (*A*) and (*B*).

(*A*) Is the scholarship of athletes on varsity teams materially different from that of their classmates?

Historical.—The bibliography of this subject, which has to do with facts, or statistics, was, until quite recently, very meager, although there is scarcely an educator of note but has expressed his opinion upon it on one side or the other. Of the few contributions which deal with facts we select the following as bearing most directly on our theme.

In 1889 Professor E. L. Richards, of Yale University, wrote in the *Popular Science Monthly* that, having examined the records of 2,425 students, he found the athletes to fall slightly behind the non-athletes in scholarship.

The bursar of the University of Pennsylvania some seven years ago published the statement that for that year the scholarship of the athlete at the University of Pennsylvania fell below that of the student body about 4 per cent., an amount which he considered negligible.

In Science for July, 1906, is an article on "Intercollegiate Athletics and Scholarship" by Professor William Trufant Foster, of Bowdoin College. This deals in a comprehensive and scientific manner with the facts regarding the scholarship of athletes and non-athletes in colleges and schools.

Professor Foster found by a careful examination of the scholarship records at Bates College for the five years 1900–1901 to 1904–1905, that the average annual difference in rank between the students playing on the baseball and football teams varied from four to eight per cent. with an average difference for the whole period of "5.6 per cent., always in favor of the men who have not taken part in intercollegiate games." In this investigation the grades were made up by twenty-five instructors. There were 132 athletes and 620 non-athletes.

In a similar study of the football and baseball men, just completed at Bowdoin College, Professor Foster found for the five years from 1899–1900 to 1903–1904 an average annual difference in favor of the non-athletes varying from .95 per cent. to 5.21 per cent. with an average difference for the whole period of 2.8 per cent. These figures represent each year the scholarship records of 280 men. They were compiled by students in education at Bowdoin.

He reports further that all the secondary schools from which he had adequate returns showed similar records. These schools are quite varied in character. At Brighton Academy the ranks for four years show that the athletes are one per cent. behind; at Thomaston High School for four years the athletes fall three per cent. below the others; at Westbrook Seminary, a private school, the athletes are slightly below the others; at Hebron Academy the athletes for three years fell five per cent. below the non-athletes.

Professor Foster concludes:

The facts were gathered by twenty men of varied opinions on the question, who were not endeavoring to make the figures from any theory or support any opinion. So far as the facts go they are authentic.

Method.—In 1898 the writer commenced an investigation into the relative scholarship standing of athletes and non-athletes in Amherst College. This investigation embraced at first the classes from 1886 to 1897, inclusive, later those from 1898 to 1903 were added. The athletic class was restricted to the players and substitutes on varsity baseball, football and track teams. In each case the books of the registrar were the sources of information and in every case the grade of a student at graduation, or for the entire time he was in college, was taken as his rank throughout. Where a comparison was made of athlete's grades in terms when he was playing and when he was not playing, as in the second part of the investigation, the term averages are of course used.

The registrar's books seem to us a fair index of the men's educational attainments. They represent the consensus of many different instructors wherein the personal equation is largely averaged out. If anything the figures will favor the athlete, for surely the majority of instructors are in favor of athletics.

No account has been taken of delinquencies, as those of past years could not be ascertained. The mark given in the subject when it, or its substitute, was made up, was alone used. This method is favorable to the lower rank men. It especially favors them in the comparison between their rank in playing and non-playing periods.

In the cases of those students who did not last out the fall term and who had delinquencies on the books no record was made of them or a passing grade given. This too is favorable to the low-grade men.

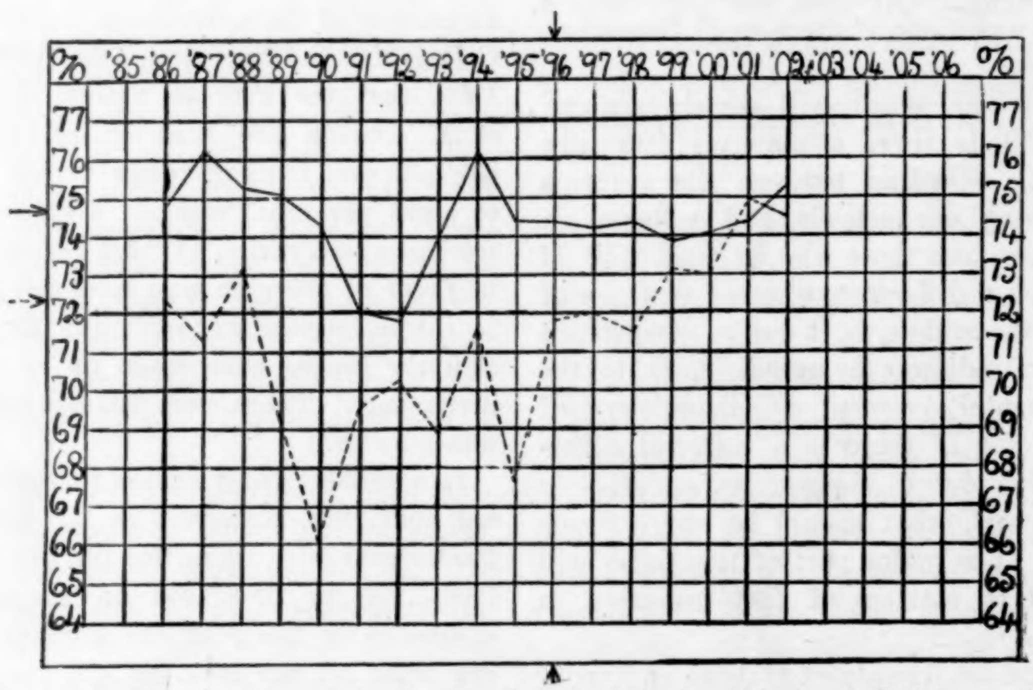

CHART I. Showing the scholastic standing of students at Amherst College on the varsity teams as compared with those not on teams, 1886–1903.

The writer undertook this investigation in the expectation, partly because of his own participation in competitive athletics and his remembrance of individual cases of high scholarship among the athletes of his day, that the athlete would make a good showing. There certainly was no prejudice on his part *against* the athlete.

It is to be remembered that at present we are not discussing the athlete's intellectual *ability*. All will agree that college marks are

not an infallible index of that. We are considering now what he accomplished intellectually in the work prescribed by his instructors. It should also be borne in mind continually that the comparison is not of the students taking normal physical exercise with those who do not, but of those in strenuous athletic competition with those not so engaged.

The averages of the three teams mentioned have been taken separately and conjointly for the years 1886 to 1903 and are indicated graphically on the accompanying charts, I. and II., in comparison with the averages of the non-athletic students. On each of these charts the years are indicated at the top and the grades at the sides. So the rise or fall of the lines shows a commensurate rise or drop in scholarship.

In Chart I., which contains the conjoint averages of all three teams, comprising 318 different athletes and 1,692 different non-athletes, a total of over 2,000 different men, it will be noted that the average scholarship of non-athletes in college varies between 72 and 76 in the different years, while that of the athletes lies between 66 and 75. The averages for the whole period are: of non-athletes 74.4 per cent., and of athletes 70.4 per cent., a difference of four per cent. The most remarkable fact shown by the comparison, however, is that in the whole eighteen years the average of athletes rises above that of non-athletes but once, and that once after the scholarship rules for athletes were made and enforced in 1896. (See arrows on the chart.)

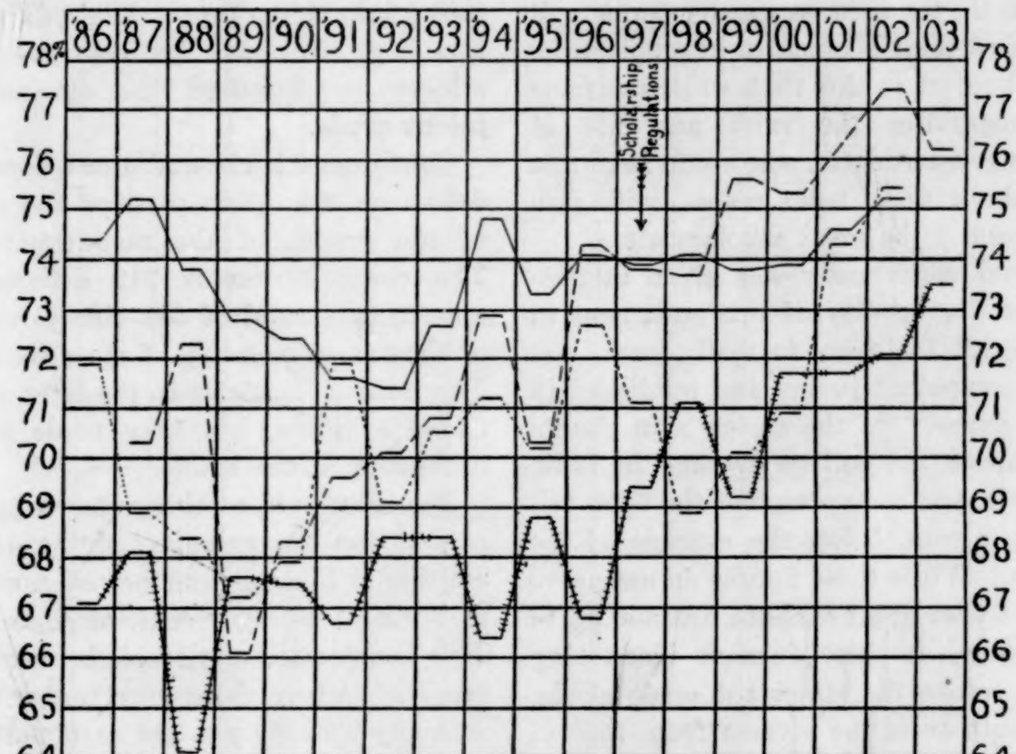

CHART II. Showing the scholastic standing of students at Amherst College on the varsity track, baseball and football teams as compared with the rest of the student body in the years 1886 to 1903.

——— non-athletic — — — track team .... base ball team ++++++++ foot ball team

In Chart II., where the team averages are plotted separately, the additional information is brought out that on the average the track team stands highest, the baseball about one per cent. below, and the football some two per cent. below that, the football team never equaling the average of the non-athletes in college the same year.

The statistics at Amherst thus corroborate those published by Professor Foster from Bates, Bowdoin and the Maine preparatory

1903
1886
27

schools. They agree also with the opinions in letters recently received from preparatory schools and universities in answer to a questionnaire. From this mass of statistics it may be safely predicated thus early in our study that, unless special means are employed to debar low-stand men or keep them up in their studies, or both, the men on varsity teams will be found below their classmates in scholarship.

Some will object to this that, while the facts are true regarding the rank and file of athletes, the great athletes, who stand head and shoulders above their team mates, will generally be found to be great scholars also.

An unusual opportunity was given at Amherst to test the validity of this statement in 1905. An all-Amherst football team was selected by competent judges and published in the college paper. Of the eleven men chosen four were above the college average in rank, seven below it, and the average of the team fell about five per cent. below the average of the non-athletes. While these figures do not prove the assertion that great athletes are not up to college average, it does furnish interesting evidence to refute the statement made above, and is a result quite the reverse from that at which President Hyde arrived in his study of fifteen years ago, in which he found that the best athletes were the best scholars of the athletic class.

Granting that the men on varsity teams are below their classmates in rank, is the four per cent. difference worthy of consideration? The bursar of the University of Pennsylvania considers it negligible; Professor Foster thinks it "so small as to overthrow two thirds of the *a priori* assumptions regarding the *excessive* injury of intercollegiate games to the scholarship of the men who play." If it is negligible, then an inquiry into whether this inferiority is the result of athletics would scarce repay us.

An analysis of these averages of athletic men is of interest as showing in part why they are lower than those of their classmates and whether the disparity may be summarily dismissed.

Such an analysis we have shown on Chart III. by distributing the athletes according to their rank, after Galton's method.

At the bottom of the chart will be seen the grades from 45 per cent. to 95 per cent. At the sides are percents from 0 to 26. The per cent. of athletes who attain each grade is indicated by a dotted horizontal line drawn above that grade at the proper level. The height of this line, then, will indicate the number of athletes per hundred who attained the subjacent grade.

Continuous horizontal lines have also been drawn on this chart to show the distribution of the grades of the non-athletic students. The chart represents 212 different athletes appearing a total of 531 times, because some of them were members of more than one team. The ranks of athletes in the later classes were added to these, but they made no material difference in the result.

The most evident thing shown by this chart is that the low averages of the athletic men are due to their greater per cent. of low grade and their lesser per cent. of high-grade men. This is especially noticeable between 50 and 65 per cent., where there were two or three times as many athletes per 100 as non-athletes, and between 85 and 95 per cent., where there are over three times as many non-athletes as athletes. Between 65 per cent. and 80 per cent., comprising three fifths of the whole class, there is not much difference in the number at each grade.

This marked inequality between athletes and non-athletes is due mostly to the football men. About six times as many football men have grades between 55 and 60 as the non-athletic class, and seven times as many non-athletes have grades from 85 to 90 as have football men. The track men make the best showing and the baseball men are intermediate in the averages.

Is it worth while for us, then, to go farther. Having seen that a difference of about four per cent. exists between the scholarship of the athlete and his classmates, and in favor of the latter, and having also, by this analysis, ascertained to what kind of marks it is due, will it repay us to find out whether this inferiority

is due to competitive athletics directly or indirectly, or to natural inability, or disinclination to learn: in short, is the game worth the candle?

The most impressive thing in the results obtained is not that there is an average difference of four per cent. between the two classes, but that the athletes fall below so uniformly. When the three teams were traced separately it was found that in the fourteen years from '86 to '99 inclusive, out of forty-two possibilities only one team equaled and one exceled the general average of the non-athletic students, really one case against forty. This means that there is some underlying constant factor depressing the grades of the athlete which we should know if we are to act intelligently. This does not postulate that if we find intercollegiate competition the cause of it we shall abolish it or even control it. Other things are to be considered.

Again, four per cent. means about one sixth of the variation in college marks, say from 65 to 90, a difference which means more than even educators fancy. This particular four per cent., say from 72 to 76, includes about 25 per cent. of all students, a drop of four per cent. then puts a quarter of the class above them. As an example of how soon a drop in scholarship is appreciated and how much it means to a college I would cite the consensus of the faculty on various classes. A class is

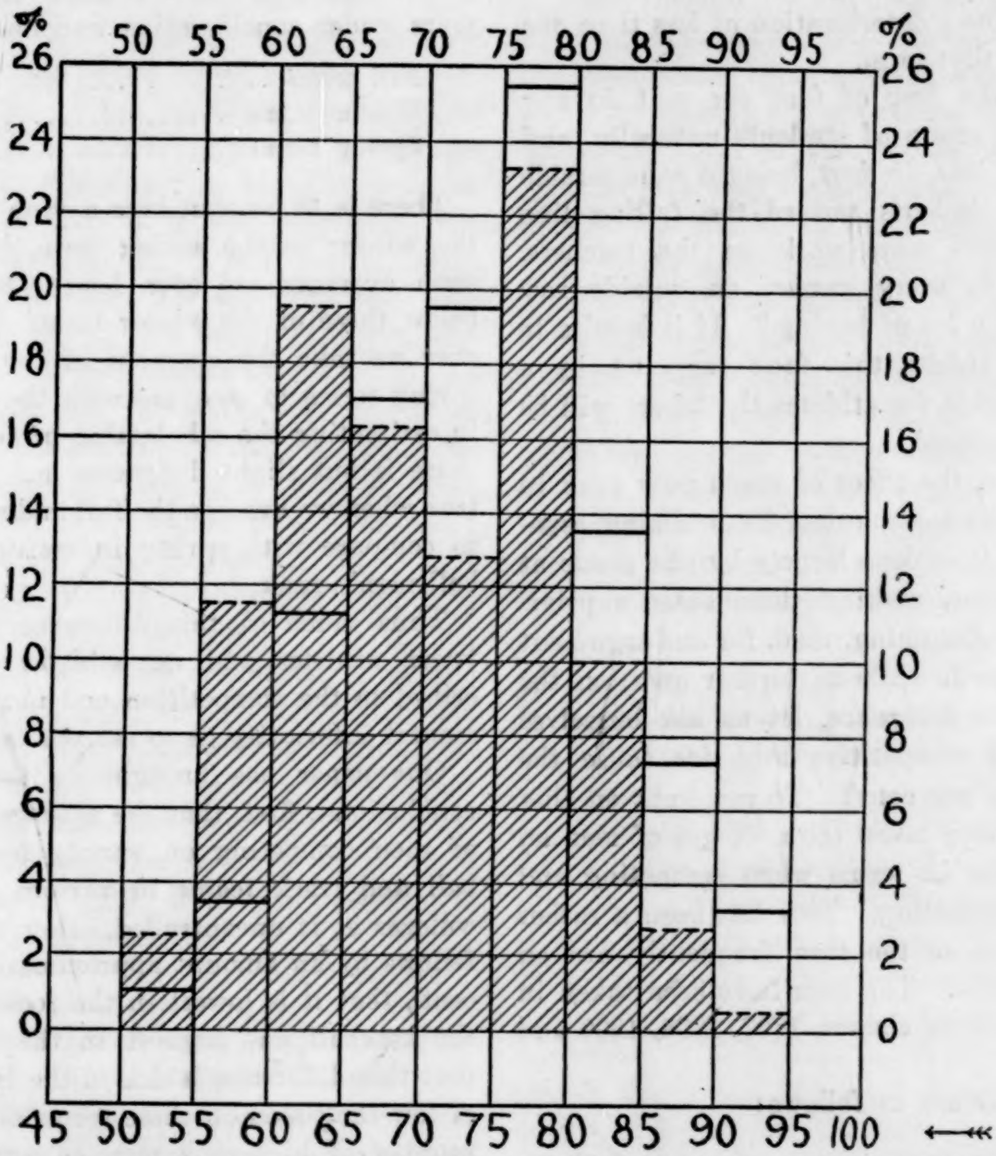

CHART III. Showing the percentage of varsity athletes who attain various scholastic grades as compared with the percentage of other students who attain the same grades.

called good, in scholarship, or poor, by common consent, when there is a difference of not more than two or three per cent. With but one exception every college professor whom I have asked says that there is a marked drop throughout the class in scholarship from the winter to the spring term and yet our Amherst statistics show a deterioration of less than one per cent. in that term.

Further, the drop of four per cent. in any considerable group of students naturally, and in this case does, in fact, bring a considerable number of students toward the failing line and so throws more work on the teachers. "There is in every garden an outside row which needs a lot of hoeing." If it is wise to attempt to reduce this four per cent. by a scholarship rule for athletes the labors will be somewhat reduced.

Once more, the effect of much poor work in the class-room is somewhat demoralizing, especially when it is done largely by one group at certain seasons, making them seem a privileged class. Assuming, then, for our argument that it is worth while to further question the cause of this difference, let us ask ourselves first, do the competitive athletics cause the drop of four per cent? To get light on this subject we have taken the averages of men on various teams in terms when competing and when not competing. This has been a rather difficult task, as the men frequently are on different teams. The men have been taken in order in the four classes, 1897, 1898, 1899 and 1900.

The results are as follows:

	Average Scholarship Standing—		
	In Terms Playing	Not Playing	Difference
Football men....	72.63	75.70	3.07—
Baseball men....	69.62	74.25	4.63—
Track men........	70.91	70.87	.04+

These figures indicate that both the football and baseball men drop off noticeably in their work during the terms in which they are competing, while the track men keep at about the same level.

It may be objected, regarding the figures for baseball and track men, that there is, as indicated previously, a noticeable dropping off in work on the part of all students during the spring term. To ascertain what that really is we have averaged the scholarship work of non-athletic men each of the terms of the college years under consideration and find for these:

Fall terms	76.62
Winter terms	77.42
Spring terms	76.79

There is to be seen here a drop of .63 from the winter to the spring term, but the fall term averages are even lower, .80 per cent. below those of the winter term. When, however we take the averages of the winter and spring terms to compare with the fall one, as in estimating the scholarship of football men, there is but slight difference and the same is true when we average the fall and winter terms to compare with spring in considering baseball men's rank.

Thus much of this difference in rank between athletes and non-athletes may be ascribed to the competition and not to inherent mental inferiority or to seasonal effects.

Our paper has brought us then to these conclusions: first, that the average scholarship of men competing on varsity football, baseball and track teams in various schools and colleges is, if uncontrolled, below that of their fellows by an amount approximating four per cent., that it is lowest in the football, next in the baseball and highest in the track team; that this difference is due to the large number of low-rank men on these teams and the small number of high-rank men as compared with the non-athletic students; and that the low rank of these athletes may, in the case of foot- and baseball, in large measure, be ascribed to the effect of being on these teams and not primarily to incapacity.

Would it be better to keep the standard of scholarship up on these teams, at the expense of depriving some of the members of this stimulus to exercise—if not to study. What is it wise to do?

If the enforcement of such a standard would deprive any considerable number of students

of the opportunity for judicious exercise the question would be an open one for the physical educator, but we are not speaking of all athletes. Only those who make the teams are subject to the strenuous requirements thereof and they, as a class, need the exercise and stimulus the least. The application of a scholarship rule to keep up the standard of scholarship then seems to us beyond a question desirable. What its effect may be is to be seen in Chart I., where the line of average scholarship in athletics rises about up to, and once above the general college average.

None of these sports, in our opinion, is it wise to abolish: they are too valuable. The responsibility is upon the faculties of our educational institutions to control them.

The number of intercollegiate or interscholastic games may be reduced, the trips cut down, or the varsity season deferred so as to last but a month and promote dissemination of sports, in the way suggested by Mr. Derby in a recent *Outlook,* but the most potent regulation is through scholarship rules.

The raising of these standards is in the hands of the faculty; it does not take great mentality, but plain old-fashioned courage to do this. If each of our colleges and schools would set and maintain such high standards for itself that any league agreements would be well outside them, then the educational ideals would be preserved.

Paul C. Phillips

THE SO-CALLED VOLCANO IN THE SANTA MONICA MOUNTAINS, NEAR LOS ANGELES, CALIFORNIA

The California papers have recently contained accounts of a so-called volcano in one of the canyons of the Santa Monica Mountains near Los Angeles. Reports of a similar kind have frequently been made heretofore with reference to points in Santa Barbara County, where fire has started in the petroleum-bearing shale near the surface; and the fire recently observed in the Santa Monica Mountains is due to the same cause. Occurrences of this kind have been described in a recent article in the *Journal of Geology.*[1]

Mr. H. R. Johnson, of the U. S. Geological Survey, now stationed at Los Angeles, visited the locality of the Santa Monica occurrence March 3, and the following notes concerning it were obtained at the time of this examination.

The "volcano" is situated about 200 yards up Pulgas Canyon from the ocean, two and one half miles northwest of Santa Monica, and about fifteen miles west-northwest of Los Angeles. Here a little point of Monterey (middle Miocene) shale jutting into the creek exhibits several small openings, from which very strong sulphurous fumes, light bluish-gray in color, are issuing. At distances of from six inches to a foot or more from the surface in the vicinity of these holes the shale is at a dull cherry-red heat, the temperature being high enough to immediately ignite bits of wood forced into it. The ground, which is here covered by shale fragments and small amounts of humus for a radius of 75 or 100 feet around this group of openings, is uncomfortably hot for the feet and at some places is too hot for even a momentary contact with the hand. At one point an oily condensation, which smelt like hot asphalt, was noted.

The shales show an interesting progressive discoloration which will be described, beginning at the outer edge of the area of alteration. Normally of a dirty yellowish-gray calcareous phase, they are first blackened by the heat, then given that intense peach-blow red which is to be seen in all of those localities in the Santa Maria oil district and elsewhere at which this peculiar type of metamorphism has taken place, while the last stage of oxidation seems to result in a crumbling greenish-gray ashy material. The finding of fragments of scoriaceous shale at the burnt area has recently been reported, but the writer saw none personally. Neither did he see any bursts of flame, which it is said have been seen at the locality, although it is very likely that such might be visible at night.

[1] "Metamorphism by Combustion of the Hydrocarbons in the Oil-bearing Shale of California," by Ralph Arnold and Robert Anderson, *Journal of Geology*, Vol. 15, No. 8, November–December, 1907.

Concerning the geology in the immediate vicinity, the canyon walls, above and below the occurrence, show sharply flexed Monterey (middle Miocene) shales. Just at the fire the structure is synclinal, the axis of the fold trending about parallel with the coast. The canary yellow discoloration of the shale due to sulphur is well developed, and exactly opposite the fire a sulphur spring trickles from the bank. At other points in and near this canyon the shales are impregnated with oil.

There is some doubt as to the origin of the fire. As no brush grows in the vicinity, and no one is living near, the origin can not well be ascribed to ignition from burning refuse on the surface. There has been a thunder storm within the month, before which time people passing up this canyon did not observe anything unusual at this point except a strong odor which was attributed to the sulphur spring. It, therefore, seems likely that the fire was ignited by lightning or else is a case of spontaneous combustion.

This unique variety of metamorphism has been at work locally in many regions of bituminous rocks in California, where a process of combustion of the hydrocarbon contents has altered the naturally white, soft shale to a rock of brilliant rose or brick-red color, and rendered it in cases hard and vesicular like scoriaceous lava. The resemblance of the products to those of volcanoes and the existence of centers like solfataras where the process of burning has been going on during the last half-century, has given rise, as in the present instance, to the statement that there were living volcanic vents in California. Though the combustion is usually local in its effects, the number and wide distribution of the occurrences of burnt shale lend importance to the phenomenon. The presence of burnt shale at depths varying from 90 to 1,040 feet below the surface, as discovered in the drilling of oil wells, proves that the burning has taken place deep down within the oil-bearing formation, as well as at the surface where it has been more commonly found. And, further, the discovery of fragments of it at one place at a depth of at least 10 feet below the surface in bedded deposits of Pleistocene age proves that such action has gone on in ages past.

The Monterey shale, of middle Miocene age, is the principal oil-bearing formation of the state, and the process of burning has had its chief effect upon portions of this formation. It is composed almost exclusively of soft and hard, thin-bedded, siliceous shales, which are largely of diatomaceous origin.

The particular shale area in which the phenomenon described is taking place forms an extensive belt underlying the Los Angeles-Santa Monica plain on the south side of the Santa Monica Mountains. Where exposed this shale is usually petroliferous, and is the source of the petroleum in the wonderfully productive Salt Lake oil field west of Los Angeles. The nearest wells, however, are eight or nine miles distant from the burning area. Although it has been impossible to put out such fires by artificial means in the instances heretofore attempted, such phenomena, as previously stated, have remained more or less restricted. Considering the surroundings and geographic position of the present area the probabilities are against any damage resulting from the burning shale.

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JOINT RECOMMENDATIONS OF THE PHYSIOLOGICAL AND BIOCHEMICAL COMMITTEES ON PROTEIN NOMENCLATURE [1]

Since a chemical basis for the nomenclature of the proteins is at present not possible, it seemed important to recommend few changes in the names and definitions of generally accepted groups, even though, in many cases, these are not wholly satisfactory. The recommendations are as follows:

First.—The word *proteid* should be abandoned.

Second.—The word *protein* should designate that group of substances which consists, so

[1] Published by order of the American Physiological and American Biochemical Societies, in joint session at the University of Chicago, on Tuesday, December 31, 1907.

far as at present is known, essentially of combinations of α-amino acids and their derivatives, *e. g.*, α-aminoacetic acid or glycocoll; α-amino propionic acid or alanin; phenyl-α-amino propionic acid or phenylalanin; guanidin-amino valerianic acid or arginin; etc., and are therefore essentially polypeptids.

Third.—That the following terms be used to designate the various *groups of proteins:*

I. Simple Proteins.—Protein substances which yield only α-amino acids or their derivatives on hydrolysis.

Although no means are at present available whereby the chemical individuality of any protein can be established, a number of simple proteins have been isolated from animal and vegetable tissues which have been so well characterized by constancy of ultimate composition and uniformity of physical properties that they may be treated as chemical individuals until further knowledge makes it possible to characterize them more definitely.

The various groups of simple proteins may be designated as follows:

(*a*) *Albumins.*—Simple proteins soluble in pure water and coagulable by heat.

(*b*) *Globulins.*—Simple proteins insoluble in pure water but soluble in neutral solutions of salts of strong bases with strong acids.[2]

(*c*) *Glutelins.*—Simple proteins insoluble in all neutral solvents but readily soluble in *very* dilute acids and alkalies.[3]

(*d*) *Alcohol-soluble Proteins.*—Simple proteins soluble in relatively strong alcohol (70–80 per cent.), but insoluble in water, absolute alcohol, and other neutral solvents.[4]

(*e*) *Albuminoids.*—Simple proteins which possess essentially the same chemical structure as the other proteins, but are characterized by great insolubility in all neutral solvents.[5]

(*f*) *Histones.*—Soluble in water and insoluble in very dilute ammonia and, in the absence of ammonium salts, insoluble even in an excess of ammonia; yield precipitates with solutions of other proteins and a coagulum on heating which is easily soluble in very dilute acids. On hydrolysis they yield a large number of amino acids, among which the basic ones predominate.

(*g*) *Protamins.*—Simpler polypeptids than the proteins included in the preceding groups. They are soluble in water, uncoagulable by heat, have the property of precipitating aqueous solutions of other proteins, possess strong basic properties and form stable salts with strong mineral acids. They yield comparatively few amino acids, among which the basic amino acids greatly predominate.

II. Conjugated Proteins.—Substances which contain the protein molecule united to some other molecule or molecules otherwise than as a salt.

(*a*) *Nucleoproteins.*—Compounds of one or more protein molecules with nucleic acid.

(*b*) *Glycoproteins.*—Compounds of the protein molecule with a substance or substances containing a carbohydrate group other than a nucleic acid.

(*c*) *Phosphoproteins.*—Compounds of the protein molecule with some, as yet undefined, phosphorus containing substance other than a nucleic acid or lecithins.[6]

(*d*) *Hemoglobins.*—Compounds of the protein molecule with hematin or some similar substance.

(*e*) *Lecithoproteins.*—Compounds of the

[2] The precipitation limits with ammonium sulphate should not be made a basis for distinguishing the albumins from the globulins.

[3] Such substances occur in abundance in the seeds of cereals and doubtless represent a well-defined natural group of simple proteins.

[4] The sub-classes defined (*a*, *b*, *c*, *d*) are exemplified by proteins obtained from both plants and animals. The use of appropriate prefixes will suffice to indicate the origin of the compounds, *e. g.*, ovoglobulin, myoalbumin, etc.

[5] These form the principal organic constituents of the skeletal structure of animals and also their external covering and its appendages. This definition does not provide for gelatin, which is, however, an artificial derivative of collagen.

[6] The accumulated chemical evidence distinctly points to the propriety of classifying the phosphoproteins as conjugated compounds, *i. e.*, they are possibly esters of some phosphoric acid or acids and protein.

protein molecule with lecithins (lecithans, phosphatids).

III. Derived Proteins.

1. Primary Protein Derivatives.—Derivatives of the protein molecule apparently formed through hydrolytic changes which involve only slight alterations of the protein molecule.

(a) *Proteans.*—Insoluble products which apparently result from the incipient action of water, very dilute acids or enzymes.

(b) *Metaproteins.*—Products of the further action of acids and alkalies whereby the molecule is so far altered as to form products soluble in very weak acids and alkalies, but insoluble in neutral fluids.

This group will thus include the familiar "acid proteins" and "alkali proteins," not the salts of proteins with acids.

(c) *Coagulated Proteins.*—Insoluble products which result from (1) the action of heat on their solutions, or (2) the action of alcohols on the protein.

2. Secondary Protein Derivatives.[7]—Products of the further hydrolytic cleavage of the protein molecule.

(a) *Proteoses.*—Soluble in water, uncoagulated by heat, and precipitated by saturating their solutions with ammonium sulphate or zinc sulphate.[8]

(b) *Peptones.*—Soluble in water, uncoagulated by heat, but not precipitated by saturating their solutions with ammonium sulphate.[9]

(c) *Peptids.*—Definitely characterized combinations of two or more amino acids, the carboxyl group of one being united with the amino group of the other, with the elimination of a molecule of water.[10]

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T. B. Osborne,
For the American Society of Biological Chemists
T. B. Osborne,
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J. A. Mandel,
A. P. Mathews,
Lafayette B. Mendel,
For the American Physiological Society

Chicago,
December 31, 1907

[7] The term secondary hydrolytic derivatives is used because the formation of the primary derivatives usually precedes the formation of these secondary derivatives.

[8] As thus defined, this term does not strictly cover all the protein derivatives commonly called proteoses, *e. g.*, heteroproteose and dysproteose.

[9] In this group the kyrins may be included. For the present we believe that it will be helpful to retain this term as defined, reserving the expression peptid for the simpler compounds of *definite* structure, such as dipeptids, etc.

[10] The peptones are undoubtedly peptids or mixtures of peptids, the latter term being at present used to designate those of definite structure.

ORGANIZATION OF A UTAH ACADEMY OF SCIENCES

At a meeting of the Utah science teachers, held in Provo during the holidays, steps were taken toward the organization of a Utah Academy of Sciences. After an informal discussion of some length Dr. Ira D. Cardiff, professor of botany, University of Utah, was elected president and Mr. Geo. W. Bailey, of Weber Academy, secretary. A committee was appointed to draft a constitution and arrange for a future meeting. The committee was composed of the president and the following: Dr. J. A. Widtsoe, president of the Agricultural College; Dr. S. H. Goodwin, president of the Proctor Academy; Dr. W. C. Ebaugh, professor of chemistry, University of Utah; Dr. D. E. Ball, professor of zoology, Agricultural College; Dr. John Sundwall, professor of anatomy, University of Utah; Dr. L. H. Hartman, professor of physics, University of Utah; Professor Marcus E. Jones, botanist, Salt Lake City; Mr. Robert Forrester, geologist, Salt Lake City; Mr. Ernest M. Hall, instructor in biology, L. D. S. High School; Mr. A. O. Garrett, instructor in botany, Salt Lake High School. The committee met in Salt Lake City in February, arranged for a

meeting to be held in Salt Lake City, April 3, 4 and 6 and drew up a constitution to be submitted at that meeting. At the April meetings eight or ten papers will be given by men engaged in various lines of scientific work in the state. On the evening of the sixth, the new organization will be addressed by President David Starr Jordan, of Stanford University. All those interested in scientific work in the state are invited to attend the meetings.

THIRD SESSION OF THE GRADUATE SCHOOL OF AGRICULTURE

The third session of the Graduate School of Agriculture, of which Dr. A. C. True is dean, will be held at Ithaca and Geneva, New York, beginning July 6, 1908, and continuing four weeks. Instruction adapted to the needs of graduate students will be given under the general heads of biochemistry, agronomy, horticulture, dairy husbandry and dairying, poultry, veterinary medicine and entomology. The following is an incomplete list of the faculty for this session:

Biochemistry.—Professor Dr. N. Zuntz, professor of animal physiology, Royal Agricultural College, Berlin, Germany; Professor L. B. Mendel, professor of physiological chemistry, Yale University; Dr. H. P. Armsby, director of Institute of Animal Nutrition, Pennsylvania State College; Dr. C. F. Langworthy, expert in nutrition, U. S. Office of Experiment Stations; Professor H. S. Grindley, professor of chemistry, University of Illinois; Professor H. C. Sherman, professor of analytical chemistry, Columbia University.

Agronomy.—A. D. Hall, director of the Rothamsted Experimental Station, England; Professor Milton Whitney, chief, U. S. Bureau of Soils; H. A. Harding, bacteriologist, New York Agricultural Experiment Station; Professor T. L. Lyon, professor of experimental agronomy, Cornell University; Professor W. J. Spillman, agriculturist, U. S. Bureau of Plant Industry; Dr. Samuel Fortier, chief of irrigation investigations, U. S. Office of Experiment Stations; C. G. Elliott, chief of drainage investigations, U. S. Office of Experiment Stations; Professor H. J. Webber, professor of experimental plant biology, Cornell University; E. G. Montgomery, instructor in agronomy, University of Nebraska.

Horticulture.—Professor J. C. Whitten, professor of horticulture, University of Missouri; Professor F. A. Waugh, professor of horticulture, Massachusetts Agricultural College; Professor S. A. Beach, vice dean, division of agriculture, and professor of horticulture, Iowa State College; Professor U. P. Hedrick, horticulturist, New York Agricultural Experiment Station; Professor John Craig, professor of horticulture, Cornell University; Professor B. M. Duggar, professor of plant physiology in its relations with agriculture, Cornell University; G. H. Powell, pomologist, U. S. Bureau of Plant Industry; W. T. Swingle, physiologist in charge, plant life history investigations, U. S. Bureau of Plant Industry; Dr. L. J. Briggs, physicist in charge, physical laboratory, U. S. Bureau of Plant Industry; Dr. Erwin F. Smith, pathologist in charge, Laboratory of Plant Pathology, U. S. Bureau of Plant Industry.

Dairy Husbandry and Dairying.—Dr. W. H. Jordan, director of the New York Agricultural Experiment Station; Professor T. L. Hæcker, professor of dairy husbandry, University of Minnesota; Dr. H. L. Russell, dean of the College of Agriculture, University of Wisconsin; Dr. E. Davenport, dean of the College of Agriculture, University of Illinois; Professor H. H. Wing, professor of animal husbandry, Cornell University; Professor R. A. Pearson, professor of dairy industry, Cornell University; Dr. L. L. Van Slyke, chemist, New York Agricultural Experiment Station; E. H. Webster, chief, Dairy Division, U. S. Bureau of Animal Industry.

Poultry.—Professor S. H. Gage, professor of microscopy, histology and embryology, Cornell University; Professor G. S. Hopkins, professor of veterinary anatomy and anatomical methods, New York State Veterinary College; Professor P. A. Fish, professor of veterinary physiology, pharmacology and therapeutics, New York State Veterinary College; Professor C. B. Davenport, department of experimental evolution, Carnegie Institution; Professor J. E. Rice, professor

of poultry husbandry, Cornell University. W. R. Graham, manager and lecturer, poultry department, Ontario Agricultural College.

Veterinary Medicine.—Professor James Law, director of the New York State Veterinary College, and professor of principles and practise of veterinary medicine, veterinary sanitary science and parasitism; Professor V. A. Moore, professor of comparative and veterinary pathology and bacteriology, and of meat inspection, New York State Veterinary College. Professor J. W. Connaway, professor of veterinary science, University of Missouri.

Entomology.—Dr. L. O. Howard, chief, U. S. Bureau of Entomology; Professor S. A. Forbes, professor of zoology, University of Illinois; Professor M. V. Slingerland, assistant professor of economic entomology, Cornell University; P. J. Parrott, entomologist, New York Agricultural Experiment Station; Dr. James G. Needham, assistant professor of limnology, Cornell University; Dr. A. D. MacGillivray, assistant professor of entomology, Cornell University; Dr. W. A. Riley, assistant professor of entomology, Cornell University; Professor E. Dwight Sanderson, director and entomologist, New Hampshire Agricultural Experiment Station.

SCIENTIFIC NOTES AND NEWS

The annual session of the National Academy of Sciences will be held in Washington, D. C., beginning Tuesday, April 21, at 11 A.M. The place of meeting will be the Smithsonian Institution. Dr. Arthur L. Day, director of the Geophysical Laboratory of the Carnegie Institution of Washington, invites the members interested to inspect the laboratory on April 22, at 4:30 P.M. The members of the academy are invited by the Smithsonian Institution to attend the Hamilton lecture in the Hubbard Memorial Hall on Wednesday evening, April 22, 1908, at 8:30. The lecture will be given by Professor George E. Hale, of the Solar Research Observatory, Mount Wilson, California; his subject being "Some Recent Advances in our Knowledge of the Sun."

The American Philosophical Society, Philadelphia, will hold a general meeting on April 23, 24 and 25. The opening session will be held on Thursday afternoon, April 23, at 2:30 o'clock, in the hall of the society in Independence Square. The morning sessions are from 10:30 A.M. to 1 P.M., and the afternoon sessions from 2:30 to 5. Luncheon for the members will be served in the rooms of the society on Friday and Saturday. A reception will be held in the hall of the Historical Society of Pennsylvania on Friday evening, April 24, at the conclusion of a lecture by Professor Henry F. Osborn on "Results of the American Museum Exploration in the Fayûm Desert of Northern Egypt." The annual dinner of the society will be held at the Bellevue-Stratford, on Saturday evening, at 7:30 o'clock.

Provision will be made by the Canadian government in the estimates for the coming financial year for a grant of $25,000 by the Dominion parliament towards the expenses of the visit of the British Association to Winnipeg. The city of Winnipeg proposes to make a grant of $5,000. The week of the meeting will probably be from August 25 to September 1, 1909.

Dr. W. M. Davis, Sturgis-Hooper professor of geology, has been selected by the German government as Harvard visiting professor at the University of Berlin for the academic year 1908–9. Professor Davis's term of service will probably fall in the second semester.

Major General A. W. Greely, eminent for his arctic explorations and his services to meteorology, having reached the age of sixty-four years on March 27, was transferred to the retired list in accordance with law.

Professor Alfred Marshall, of Cambridge University, who succeeded the late Professor Henry Fawcett in the year 1884, intends to resign the professorship of political economy, at the beginning of the Easter term.

Dr. Theobald Smith, professor of comparative pathology at Harvard University, has been elected honorary fellow of the Society of Tropical Medicine and Hygiene of London and honorary member of the recently organized Société de Pathologie Exotique, Institut Pasteur, Paris.

DR. A. A. MICHELSON, professor of physics in the University of Chicago, has been elected an honorary member of the Royal Irish Academy.

AMONG those on whom the University of Aberdeen has decided to confer the honorary degree of LL.D., at the graduation ceremony in April, is Professor W. D. Halliburton, F.R.S., of King's College, London.

DR. LEO S. ROWE, of the faculty of the Wharton school of finance and economy of the University of Pennsylvania, has received the honorary degree of doctor of laws from the National University of La Plata.

DR. D. P. PENHALLOW, professor of botany in McGill University, has been elected a governor's fellow, to serve on the corporation in the place of the late Dr. Harrington.

DR. and MRS. N. L. BRITTON and Dr. Arthur Hollick, of the New York Botanical Garden, sailed for Kingston, Jamaica, on February 22. They planned to make collections at the western end of the island, and a Bahamian schooner has been chartered for this purpose. It is expected that a stop will be made in eastern Cuba on the return voyage early in April.

PROFESSOR V. L. KELLOGG, of Stanford University, will be in Europe from April to December of this year. His address is care French, Lemon and Co., Florence, Italy.

PROFESSOR HERBERT F. ROBERTS, of the Kansas State Agricultural College and Experiment Station, leaves for Europe in May, returning about the middle of September. He is commissioned from the Kansas Experiment Station to inspect the wheat regions of central and southern Europe in search of superior sorts of hard wheats for introduction into Kansas.

DR. J. E. CLARK, professor of chemistry in the Central University of Kentucky, sailed on March 14 for Naples, to remain abroad till next fall. He expects to spend three months at the University of Berlin.

DR. A. S. ALEXANDER, professor of veterinary science in the College of Agriculture of the University of Wisconsin, has been appointed a member of the committee which will arrange a proper representation at the Ninth International Veterinary Congress, which is to meet this year at The Hague.

PROFESSOR J. J. GREEN, formerly in charge of the electrical engineering department of Notre Dame University, has gone abroad to make a tour of the more notable electrical plants of Europe, and to attend the Marseilles International Electrical Exposition.

ALEXANDER C. LANIER, assistant professor of electrical engineering in the University of Cincinnati, has resigned and will proceed with higher studies in the Harvard Graduate School of Applied Science.

JOSEPH W. HAYWARD, assistant professor of mechanical engineering at McGill University, has resigned in order to enter outside engineering work.

THE Bakerian lecture of the Royal Society was delivered on March 26, by Professor C. H. Lees, F.R.S., his subject being "The Thermal Conductivities of Solids."

THE Ohio State University chapter of Sigma Xi will conclude its annual lecture course on April 9 with a lecture by Professor Francis E. Nipher, of Washington University, St. Louis. Professor Nipher will speak on "The Limits of Scientific Thinking." On January 7 Professor Wallace C. Sabine addressed the society and its friends on "Optical Resolving Power in its Application to Biological Problems." Dr. H. G. Wells, of the University of Chicago, delivered a lecture on March 24. The title of his lecture was "The Present Status in the Search for the Cause of Tumor Formations."

THE Syracuse chapter of Sigma Xi held an open meeting in the new Lyman Hall of Natural History on March 20, when Professor Clement D. Child, of Colgate University, gave a lecture on "Some Phenomena connected with the Electric Arc."

THE Royal Society, the Royal Geographical Society and Trinity House have undertaken the expense of a memorial to the late Sir Leopold McClintock in Westminster Abbey, with the consent of the dean and chapter.

The memorial will consist of an alabaster slab, to be placed underneath the monument to Sir John Franklin, whose fate was definitely ascertained by Sir Leopold during his celebrated expedition on board the *Fox*. The inscription will be as follows: "Here also is commemorated Admiral Sir Leopold McClintock, 1819–1907. Discoverer of the Fate of Franklin in 1859."

DR. EDOUARD ZELLER, the eminent historian of philosophy, professor in the University of Berlin, from 1872 until his retirement from active service in 1895, died on March 19, at the age of ninety-four years.

SIR JOHN ELIOT, F.R.S., director general of Indian Observatories and meteorological reporter to the governor of India from 1886 to 1903, eminent for his services to meteorology, has died at the age of fifty-eight years.

THE Prague journals announce the death in that city, on March 11, of Professor Josef Hlávka, a distinguished architect, patron of science and art, and president of the Bohemian Academy of Sciences and Art. The deceased, whose gifts for archeological and other research were very large, bequeathed the sum of 5,000,000 crowns, or about five sixths of his whole property, for the purposes of advancing Bohemian research and art, and for aiding talented but needy students of Bohemian nationality. The funds are to be expended under the auspices of the academy.

THE U. S. Civil Service Commission announces an examination on April 29, 1908, to fill at least three vacancies in the position of magnetic observer (temporary) in the Coast and Geodetic Survey, and vacancies requiring similar qualifications as they may occur. The salaries will range from $60 to $75 a month, according to the character of the work and the qualifications of the applicant; and in exceptional cases where the person employed has had repeated experience in magnetic work the salary may reach $100 a month. Appointments to permanent positions are made from the examination for laboratory assistant in the Bureau of Standards.

THE next meeting of the Astronomical and Astrophysical Society of America will be held at Put-in-Bay Island, Lake Erie, on August 25 and succeeding days.

THE Smithsonian Institution has learned, through the Department of State, that the Second International Archeological Congress will hold its meeting at Cairo, Egypt, at the Latin Easter, in 1909. The congress will be opened under the presidency of the Khedive.

UNIVERSITY AND EDUCATIONAL NEWS

THE Kentucky legislature, just adjourned, changed the name of the College of Agriculture and the Mechanic Arts to the State University and appropriated to it $200,000 in addition to what it has already been receiving; $30,000 of this amount is to be annual. At the same time it appropriated $150,000 each to the two new State Normal Schools. The legislature also changed the name of "Kentucky University," a denominational institution, back to Transylvania University.

MRS. L. V. MORGAN, of Harrison, Ohio, has donated to the State University of Iowa the extensive botanical collections of her husband, the late Professor A. P. Morgan. The donation includes the entire herbarium, together with accompanying books and pamphlets. These collections have been assigned a place in one of the new fire-proof buildings on the Iowa campus. The herbarium represents, better than any other in the country, the rich mycologic flora of the lower Ohio valley, and owing to the eminence of Professor Morgan as a student of mycology must ever remain of extreme historic importance.

DURING the present winter semester, there studied in the German medical schools 151 women, while in the Swiss medical schools the number was 1,129.

DR. JOHANNES VON KRIES, professor of physiology at Freiburg, has been called to Munich as the successor of the late Professor Karl von Voit.

DR. FRITZ RINNE, professor of geology at the Hanover Technological School, has been called to a chair at Königsberg.